41st Annual...

SOUTH DAKOTA
STATE UNIVERSITY

SDSU

SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM BERESFORD

PROGRESS REPORT 2001

Agricultural Experiment Station
South Dakota State University
Brookings

Southeast Research Farm
29974 University Road
Beresford, South Dakota 57004

The purpose of this page is to grab your attention and convince you to join the Southeast Experiment Farm Corporation. The Southeast Farm Corporation consists of people just like you from southeast South Dakota and the surrounding area.

Around 1955, a group of progressive farmers began efforts to create an association that would be concerned with agricultural research in southeast South Dakota. On May 3, 1956, a non-profit organization, the Southeast Experiment Farm Corporation, was formed. The purpose of the corporation was to acquire and disseminate information concerning crop and livestock production.

The business affairs of the corporation are handled by a very active Board of Directors. Members of the board are elected for a two-year term from each participating county. An annual meeting is held each year to allow members to review the activities of the corporation and hear reports on progress of research projects and make suggestions on research that may need to be added to solve upcoming problems. Because the corporation is non-profit, all funds generated by the corporation are used to advance research through improvement of buildings and facilities located at the station.

We are currently working to add more new members to the Southeast Experiment Farm Corporation. Lifetime memberships to the corporation are $25. You will not be asked for more than that. This is a one-time $25 membership. These memberships are also transferable, so if you know of someone who has retired from farming and is a member, that membership can be transferred to you or anyone else.

This membership to the corporation is not a large amount, but it helps us in many ways. If you become a member, you will automatically receive our annual report, right off the press, in January; as well as letters during the year to keep you informed of activities at the farm and what dates and times tours will be held. Another important benefit is the more members we have demonstrates strong support and proof that there is a great deal of interest and need for agricultural research throughout southeast South Dakota.

We hope if you are not a member that you will join us. If you decide to join, send a check to the Southeast Farm Corporation for $25 to the above address. If you have a membership that needs to be transferred, clip this page out on the line and fill out the information needed on the other side. We will be glad to process your certificate and add you to our permanent mailing list. Thanks.

Southeast Experiment Farm Corporation
29974 University Road
Beresford, South Dakota 57004
January 2002

Subject: Transfer of Membership

The Board of Directors would like to see existing memberships, that are not active, transferred to a relative or an interested party participating in agriculture located in the same county, if possible. The reason for this transfer, is that a county must maintain a certain number of voting shares in order to elect a director. The directors look after the business affairs of the research farm, make known the research needs of each county, and participate in management decisions of the farm. It is important that each county maintain their representation in order to participate in these affairs.

If this transfer meets with your approval, please enter the name of the party you wish to transfer the membership to, sign your name in the proper blanks below and send this letter, together with the membership share, if possible, to the address listed above.

If there are no interested relatives, you may wish to use option # 2, and delegate the responsibility to the Board of Directors to locate any interested party in the same county.

Option #1:
Please Transfer membership to: ______________________________

Address: ______________________________

____
Signature

Address: ______________________________

Option #2:
I wish to transfer this membership to the Board of Directors, authorizing them to give this voting membership to an interested party within the county.

____
Signature

Address: ______________________________

This forty-first annual report of the research program at the Southeast South Dakota Research Farm has special significance for those engaged in agriculture and the agriculturally related businesses in the ten county area of Southeast South Dakota. The results shown are not necessarily complete or conclusive. Interpretations given are tentative because additional data resulting from continuation of these experiments may result in conclusions different from those based on any one year.

Trade names are used in this publication merely to provide specific information. A trade name quoted here does not constitute a guarantee or warranty and does not signify that the product is approved to the exclusion of other comparable products. Some herbicide treatments may be experimental and not labeled. Read and follow the entire label before using.

South Dakota Agricultural Experiment Station
Brookings, SD 57007

Dr. Fred Cholick, Dean Dr. Kevin Kephart, Director

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SOUTHEAST SOUTH DAKOTA EXPERIMENT FARM
41st ANNUAL PROGRESS REPORT

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1500 copies of this document were printed by the Southeast Research Farm at a cost of $2.07 per document.

INTRODUCTION -- Robert K. Berg

This publication is our 41st Annual Progress Report, featuring many of the crop and livestock research and demonstration projects conducted at the Southeast Research Farm in 2001 by the dedicated faculty, staff, and graduate students associated with the South Dakota Agricultural Experiment Station and Cooperative Extension Service as well as the directors and members of Southeast South Dakota Experiment Farm Corporation.

Several important milestones were achieved by a couple of our staff this year. Dale DuBois, Agricultural Technician, retired this summer after completing 34 years of service at our station. Ruth Stevens, our Statistical Assistant, received her 20-year Career Service Award this fall. I personally appreciate their sincere dedication to our operation. We all extend our best wishes to Dale and his wife Barb during their retirement. We also welcome Kent Tjardes, the new Beef Feedlot Specialist in the Animal and Range Sciences Department at SDSU, who is conducting research in our feedlot.

Temperature and precipitation at SE Research Farm during 2001 are shown in tables and graphs beginning on page 1. We received 26.3 inches of annual precipitation, which is 1.1 inch above our long-term average (104% of normal). Our growing season precipitation measured during April through September was 18.8 inches (0.1 inch above normal). Even though annual and growing season precipitations were near normal, extreme deviations were observed this year. January, April, and November each received more than 200 to 300% of their normal amounts of precipitation, while February, March, June, August, October, and December only received about half or less of their normal precipitation. Annual snowfall was 26.8 inches in 2001 with 80% of it falling from January through June (21.5 inches) and 5.3 inches between July and December.

We accumulated 3,173 growing degree units (99% of normal) from April through October. The coldest low and coldest high temperatures of the year were -23°F and -4ºF, respectively, and both occurred on February 2. The hottest high temperature recorded was 95°F on June 25 and 26 and the warmest low temperature was 75°F on July 31. Average maximum monthly air temperatures were from 11°F below normal to 14°F above normal. The average minimum monthly air temperatures were 8°F below to 8°F above normal. February and March were 5 to 10 degrees below normal, whereas November and December were 5 to 15 degrees above normal. The other eight months were within two or three degrees of their long-term average temperatures. The last freezes this spring occurred on April 21 (26°F) and April 18 (31°F), then resumed again in the fall on September 24 (32°F) and October 6 (23°F). This gave us a frost-free season of 156 and 171 days on a 32°F and 28°F basis, respectively.

The year began cold with continuous snow cover from early November 2000 through nearly all of March 2001. Much of the moisture recorded in January actually came as rain. Rainy weather in late April and early May, late July, and again in November provided adequate moisture to produce average or better yields for most crops and help recharge soil moisture levels.

Early spring fieldwork was delayed until mid April. Some small grains and early corn were planted during mid to late April. Then rainy weather made it difficult to plant again in many fields until mid May. Most crops were at least moderately stressed for moisture several times during the growing season. Early fall weather was mild and dry which allowed plenty of time to harvest row crops and finish fieldwork.

Crop production was generally average or above this season. Most corn yields averaged between 140 to 180 bu/ac. Oat yields of 70 to 130 bu/ac were observed. Spring wheat and soybean yields averaged 45 to 65 bu/ac. Established alfalfa produced up to 6 ton/ac of forage on a dry matter basis. Grasshopper and first-generation corn borer pressures were relatively light, but second-generation corn borer activity was quite high here toward the end of the growing season. Bean leaf beetles were common again on nearly all soybean fields, but Bean Pod Mottle Virus symptoms appeared to be a little less noticeable on the grain at harvest compared to the past few seasons. Soybean cyst nematode populations became more widespread in areas where they were first detected here in 2000. Stem canker and charcoal rot were also identified on some of our soybean in addition to phytophthora and other diseases. Crop prices were extremely low again, but livestock prices were generally better than in recent years.

This year's swine report follows up on an experiment conducted a year ago showing that feeding high-oil corn may affect how disease is spread in feeder pig operations. Crop reports show results of the many weed control projects that were conducted here in 2001 as well as variety test results for alfalfa, oat, corn, and soybean (including Roundup Ready row crops). Our tillage and crop rotation project is now in its 11th year and is featured along with cooperating efforts on its long-term economics and the dynamics of its indigenous soil nematode populations. Several soil fertility research projects are highlighted as well as evaluations of white corn, BT corn, and polymer coatings for protecting corn seed. Soybean cyst nematodes and other plant pathogens continue to be a problem in our region and work in these areas is presented in addition to how aerial imagery was used in defoliation research to help find improved ways to evaluate insect and hail damage on soybean.

A wealth of information can be readily accessed from South Dakota State University through the Internet (http://www.abs.sdstate.edu). Crop performance and variety trials, daily corn borer populations throughout the season, weather information for many of our research stations, marketing information, several years of our annual research progress reports, and much more are readily available.

Please feel free to stop by and visit whenever you can. Let us know if you need additional copies of our report or if we can be of further assistance in any way. We can be reached by electronic mail, regular mail, or telephone at:

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TILLAGE & CROP ROTATIONS FOR SOUTHEAST SOUTH DAKOTA

R. Berg, D. DuBois, B. Jurgensen,
R. Stevens, and G. Williamson

Southeast Farm 0101

SUMMARY

- Two-crop systems were the most productive on a whole farm basis, but economic return varied depending on how it was tilled and which crops were grown.

- Reestablishing alfalfa dramatically reduced both the production and economic return of four-crop rotations.

- Spring wheat yields were excellent, especially when conventionally tilled and it was the only crop whose market price exceeded the loan rate.

- No-till management increased soybean yield, except when produced in corn-soybean rotations, without improving economic return.

- Bean Pod Mottle Virus was uniformly observed with relatively light levels on soybean grain in all cropping systems at harvest.

- Corn yield was not generally affected by crop rotation or tillage method, but conventionally tilled corn typically had nearly $50/ac more economic return than its no-tilled counterpart.

- Grain dry matter nutrient protein yields averaged nearly 1,000 lb/ac for corn and soybean and 650 lb/ac for spring wheat; oil yields averaged 400 lb/ac for corn and 600 lb/ac for soybean. Corn also contained 4 ton/ac of starch, 33 lb/ac of lysine, and 19,300 Mcal/ac of non-ruminant metabolizable energy.

INTRODUCTION

The 2001 growing season marks the 11th consecutive year for this project and the beginning of its third five-year phase. It still focuses on long-term production and economics of seven cropping systems to help producers decide if cropping system modifications might benefit their operation. The project evaluates no-till and conventional tillage in various crop rotations, as well as ridge-till in a corn-soybean rotation (Table 1). These systems were established in 1990 and have been reported annually since 1991, except in 1993 (31st through 40th Annual Research Progress Reports).

The project's basic structure has not changed, and we continue looking at other types of information. For example, this spring we obtained geo-referenced electro-magnetic data to characterize the field's apparent electrical conductivity. This measures spatial changes in water, salt, clay content, and other properties in the upper soil profile that can affect crop performance. We also collected cores in the fall to look at soil quality in terms of bulk density, aggregate stability, and other properties. Perennial alfalfa was reestablished this spring because stands were thin or nearly dead in parts of several plots. Bean Pod Mottle Virus (BPMV) symptoms on soybean grain were also monitored again this fall.

Table 1. Cropping systems evaluated at Southeast Research Farm; Beresford, SD; 1996-2001.

System	Tillage	Crop Rotation
NT2	No-Till	Corn-Soybean
RT2	Ridge-Till	(C-S)
CT2	Conventional	(C-S)
NT3	No-Till	Corn-Soybean-Wheat
CT3	Conventional	(C-S-W)
NT4	No-Till	Corn-Soybean-Wheat+Alfalfa
CT4	Conventional	(C-S-W+A)

Some information is presented in a slightly different manner this year. Statistical results are based on a split-plot design using subsets of balanced data, including separate analyses for ridge-till results for corn-soybean rotations. Complete analyses for net incomes and costs of production are not completed yet. Economic results shown here reflect preliminary partial economic returns calculated for every plot.

Other collaborative research associated with this project is published as separate reports. Doug Franklin, SDSU Ag Economist at Brookings, summarized long-term economic results using different assumptions, see *Long Term Profitability of Tillage and Crop Rotations for Southeast South Dakota* (Economics 0102, page 22). Jim Smolik, SDSU Plant Pathologist at Brookings, looked at various types of nematode populations in this field and how they changed during the season, see *Effect of Crop Rotation and Tillage on Nematode Populations*, (Plant Science 0103, page 25)

METHODS

Field operations for 2001 are outlined in Table 2. Spring wheat was drilled in 7.5-inch row widths with corn and soybean rows established on 30-inch centers. 'Forge' spring wheat was planted at approximately 1,292,000 seeds/ac (100 lb/ac) on April 20. Both row crops were planted using Roundup Ready seed. DeKalb 580RR corn was planted at 26,900 seeds/ac on May 14. Prairie Brand 1901RR soybean was planted at 157,000 pure live seed (PLS)/ac (64 lb/ac) on May 29. Pioneer 5454-N221 alfalfa was drilled without a nurse crop on May 15, 2001 at approximately 15 lb PLS/ac, with an additional 15 lb PLS/ac sown into the no-till plots on July 30 to help compensate for a thin stand.

Table 2. Field operations for tillage and crop rotation systems[1]. Southeast Research Farm; Beresford, SD; 2001.

Tillage System	2001 Crop Rotation	Growing Season[2] Before	During	After
NT2	Corn	rotary hoe, fertilize (2X), herbicide	herbicide, fertilize	chop stalks
	Soybean	rotary hoe, fertilize, herbicide	herbicide (2X)	
RT2	Corn	rotary hoe, fertilize (2X), herbicide	fertilize, cultivate, herbicide	chop stalks,
	Soybean	rotary hoe, fertilize, herbicide	herbicide (2X) cultivate (2X)	
CT2	Corn	field cultivate, fertilize (2X), herbicide	fertilizer, cultivate	chop stalks, disk, chisel
	Soybean	field cultivate (2X), fertilize, herbicide	herbicide, cultivate	chisel
NT3	Corn	rotary hoe, fertilize (2X), herbicide	herbicide, fertilize	chop stalks
	Soybean	rotary hoe, fertilize, herbicide	herbicide (2X)	
	Wheat	fertilize (2X)	herbicide	herbicide
CT3	Corn	field cultivate, herbicide	fertilize, cultivate	chop stalks, disk, chisel
	Soybean	field cultivate (2X), fertilize, herbicide	cultivate, herbicide	chisel
	Wheat	disk, fertilize (2X)	herbicide	herbicide
NT4	Corn	fertilize (2X), herbicide	herbicide (2X)	chop stalks
	Soybean	fertilize, herbicide	herbicide (2X)	
	Wheat	fertilize	herbicide	herbicide
	Alfalfa	fertilize	clip (4X)	
CT4	Corn	field cultivate (2X), herbicide	herbicide, cultivate	chop stalks, disk, chisel
	Soybean	field cultivate, fertilize, herbicide	herbicide, cultivate	chisel
	Wheat	disk, fertilize (2X)	herbicide	herbicide, chisel
	Alfalfa	chisel, field cultivate, fertilize (2X)	clip (2X)	

[1]All plots were also planted, but only grain crops were harvested. 2002 corn and wheat plots were soil sampled (October, 2001).
[2]Before = Jan 1 to planting/emergence; During = from planting or alfalfa emergence to harvest or fall dormancy (includes banding herbicide and/or starter fertilizer at planting). After = from harvest or fall dormancy to Dec. 31.

Table 3 summarizes this year's fertilizer and pesticide applications. Liquid fertilizer (as 10-34-0 and/or 28-0-0) was broadcast before planting according to soil test recommendations for yield goals of 145-bu/ac corn, 50-bu/ac soybean and wheat, and 5-ton/ac alfalfa. Corn received a popup application of liquid starter fertilizer with the seed at planting and was side dressed with 28-0-0 between alternate rows in mid June. Apparent soil electrical conductivity data was collected for the entire field using an EM meter and a GPS receiver on May 20. Liquid permethrin (Pounce) was used to treat first-generation corn borer for both four-crop corn systems, which had been planted into the previous year's alfalfa stubble. Soil samples were collected this fall to determine fertilizer requirements for next year's corn and wheat. Separate soil cores are currently being analyzed for bulk density, aggregate stability, and other properties.

Harvest stand counts were measured for annual crops as well as mature plant heights for wheat and soybean. Wheat was swathed before combining and straw was not baled in 2001. Row crops and small grain were harvested with a combine, weighed in a weigh wagon, and had geo-referenced data collected with a yield monitor. Grain samples were measured for moisture content, test weight, and nutrient content (dry matter, protein, oil, and/or starch). Lysine and non-ruminant metabolizable energy were also calculated for corn. New alfalfa stands were clipped during the season as needed to help control weeds, but production and quality were not directly measured.

Grain yields are adjusted to standard moisture contents based on weigh wagon data with nutrient compositions reported on a dry matter basis. Soybean grain samples were visually ranked for symptoms of Bean Pod Mottle Virus (BPMV) infection at harvest (0 = none, 1 = slight, 2 = moderate, and 3 = high).

Tillage and rotation combinations involve twenty treatments with each one replicated four times. Plot size is 0.4 ac (60 ft x 300 ft). Statistical comparisons for agronomic production are obtained with analysis of variance for treatment means by crop and as whole farm systems in SAS with the General Linear Model as a split-plot design using Least Significant Differences (LSD) at the 90% probability level.

Market economic returns reflect local elevator prices at harvest based on fresh weight yields for individual plots less a few variable expenses for inputs like seed, fertilizer, pesticide, and any relevant dockages (moisture, test weight, protein, etc.). An alternative strategy includes substituting county loan prices at actual yield levels without other farm program benefits. Market prices in 2001 were \$1.62/bu for corn, \$3.94/bu for soybean, and \$2.86/bu for wheat. Loan prices were \$1.73/bu for corn, \$5.11/bu for soybean, and \$2.57/bu for wheat.

RESULTS & DISCUSSION

Winter's lingering snow cover provided good soil moisture for seeding and made it difficult to plant most crops very early. After sowing wheat, prolonged rains kept us from planting corn, alfalfa, and soybean until mid to late May. Summer precipitation was very limited during most of June and July. Alfalfa seedlings and row crops were moderately to severely stressed for moisture several times, before mid summer rains provided enough water for crops to mature.

Table 3. Pesticide and fertilizer rates for tillage and rotation system study. Southeast Research Farm; Beresford, SD; 2001.

ROTATION	TILLAGE	CROP	FERTILIZER	HERBICIDE[1]
			N-P-K[2]	
C-S	NT	S	6-20-0	Prowl+Roundup, PP; Roundup, Post 2X
		C	174-70-0	Dual+Roundup, PP; Roundup, Post
	RT	S	6-20-0	Prowl+Roundup, PP; Roundup, Post 2X
		C	159-70-0	Dual+Roundup, PP; Roundup, Post
	CT	S	6-20-0	Prowl, PPI; Roundup, Post
		C	144-70-0	Dual, PPI
C-S-W	NT	W	96-20-0	Buctril+MCPA Ester, Post; Roundup, BD
		S	6-20-0	Prowl+Roundup, PP; Roundup, Post 2X
		C	144-70-0	Dual+Roundup, PP; Roundup, Post
	CT	W	66-20-0	Buctril+MCPA Ester, Post; Roundup, BD
		S	6-20-0	Prowl, PPI; Roundup, Post
		C	62-30-0	Dual, PPI
C-S-W+A	NT	W	96-20-0	Buctril+MCPA Ester, Post; Roundup, BD
		S	6-20-0	Prowl+Roundup, PP; Roundup, Post 2X
		A1	6-20-0	None
		C	64-70-0	Dual+Bladex+Roundup, PP; Pounce+Roundup, Post; Roundup, Post
	CT	W	66-20-0	Buctril+MCPA Ester, Post; Roundup, BD
		C	8-30-0	Dual, PPI; Pounce+Roundup, Post
		S	6-20-0	Prowl, PPI; Roundup, Post
		A1	6-20-0	None

[1]Herbicide Treatments: PPI = preplant incorporated; PP = preplant; Post = Post emergence; BD = burndown
[2] Liquid fertilizer applied as 10-34-0 and 28-0-0

Crop production was excellent for spring wheat and average or above for warm season row crops. The percentage of intended yield goal actually achieved averaged 107% for corn, 89% for soybean, and 122% for spring wheat. Newly planted alfalfa seemed to establish well, especially for the conventionally tilled system. Additional seed was planted in late July to help ensure adequate no-till alfalfa stands. Only grain production was measured this year because alfalfa was being reestablished.

Pest problems were minimal this year. Corn in four-crop systems was planted into alfalfa stubble and needed treating for first-generation corn borer. Bean leaf beetles were common on soybean again this season. They were generally below threshold levels and BPMV symptoms on harvested grain were uniformly distributed and levels appeared relatively light.

Crop Production and Quality

Large differences were seen in whole farm production between rotations (Figure 1). The most obvious trend was lower production associated with four-crop systems where 25% of the acreage contained newly seeded alfalfa that was not harvested for market. Two-crop rotations produced the most grain at nearly 1,800 ton/system followed by three-crop rotations at 1,585 ton/system. Four-crop rotations produced a little more than 1,200 ton/system. The type of tillage used did not significantly affect the total amount of crop harvested in these systems.

Corn had the greatest yield (4 ton/ac), followed by wheat (1.8 ton/ac) and soybean (1.3 ton/ac) as shown in Figure 2. Corn accounted for about 75% of the total harvested production (THP) in two-crop rotations and 58% in three- and four-crop systems. Soybean provided approximately 23% of THP in two- crop rotations and 17% in three- and four-crop rotations. Wheat produced 25% of the THP in three- and four-crop systems.

Preliminary evaluation of apparent electrical conductivity values indicated that readings were greater for the deeper zone than near the surface (65 vs. 43 mS/sec), but were relatively consistent among crops, tillage methods, and rotations (data not shown). Color maps showed that higher EM readings were spatially associated with alleyways and corresponded remarkably well with wetter sites and areas known to have lower crop performance.

Corn grain yield averaged 155 bu/ac (107% of the yield goal) with 18.4% moisture, 56.0 lb/bu test weight, and a plant population of 23,500 plants/ac (Table 4). Corn production was influenced more by tillage than rotation (Tables 5 and 6). Conventionally tilled corn had better stands and test weight and was a little drier at harvest than no-tilled corn, but grain yields were similar (Table 6).

Soybean population averaged 117,000 plants/ac (75% of the PLS planted), yielded 44 bu/ac (89% of yield goal), was 33 inches tall and had 10% moisture content and 57.5 lb/bu test weight at harvest (Table 8). No-till production increased soybean yield by 7% (3 bu/ac, Table 10), except when grown in the two-crop rotations (Table 8) some of which also had lower populations (Table 9). Soybean grain in all cropping systems had visual scores of 1.0 indicating uniformly distributed but relatively light BPMV infection this fall.

Spring wheat production this summer was among the highest ever measured for this project (61 bu/ac). It was nearly 38 inches tall, dried down well at harvest (11.5% moisture), had

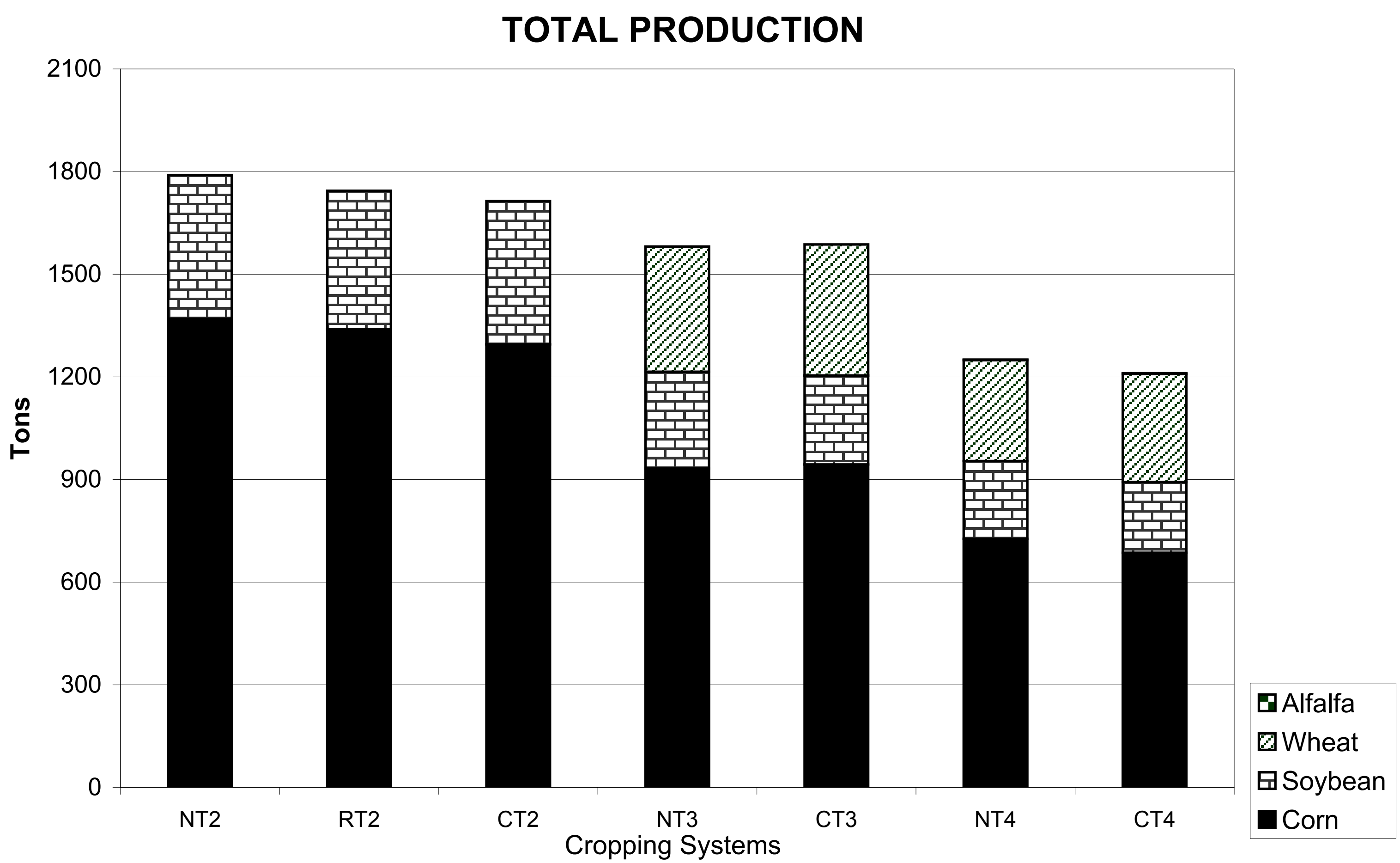

Figure 1. Total Production of Crops Harvested in Tillage and Crop Rotation Study (640 ac/system) at Southest Research Farm; Beresford, SD; 2001.

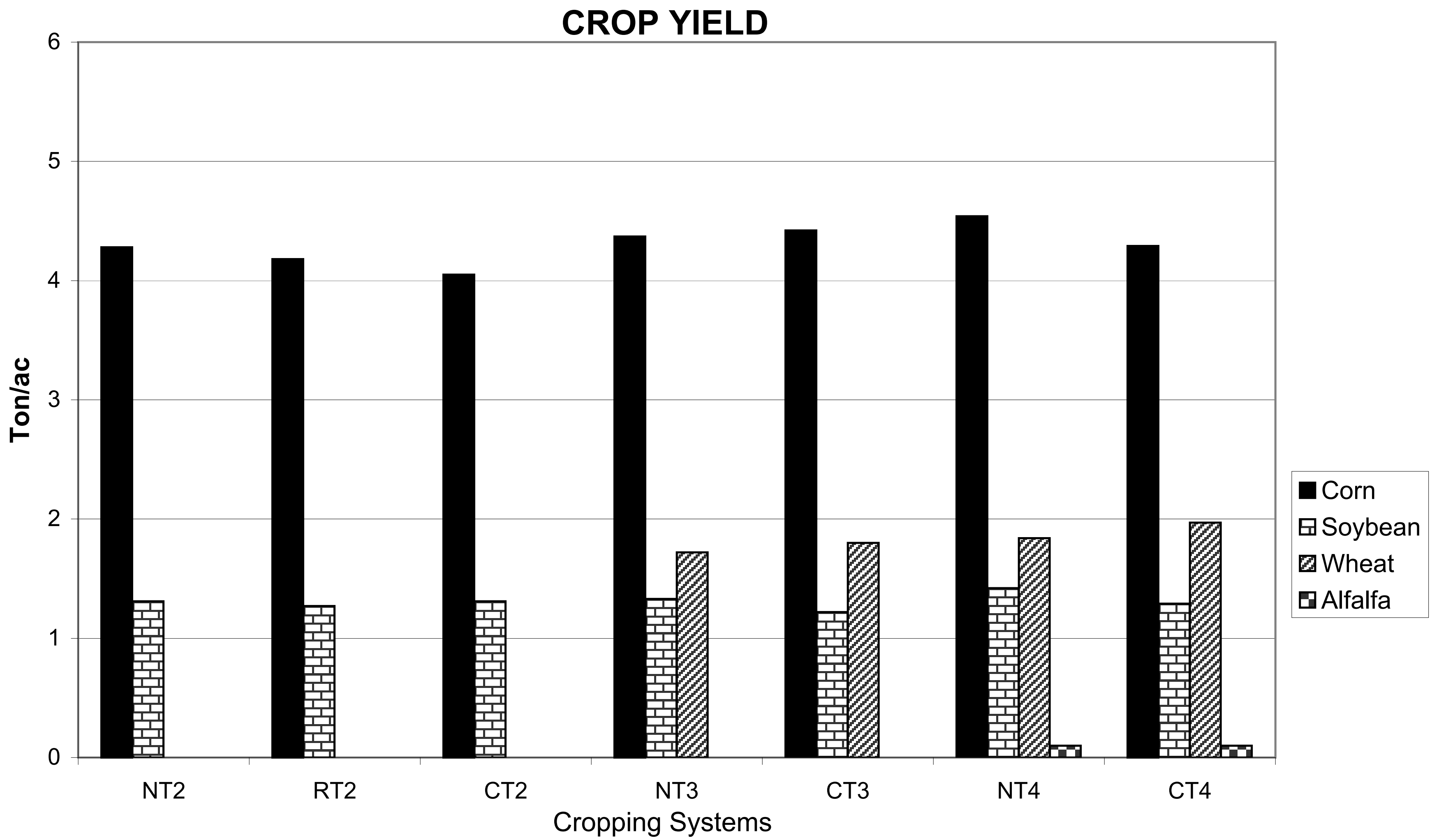

Figure 2. Effects of Tillage and Crop Rotations on Crop Yields at Southeast Research Farm; Beresford, SD. 2001.

good test weight (59 lb/bu), and yielded 122% of our yield goal. Conventionally tilled wheat generally out yielded systems grown with no-till management (Table 14). Wheat in four-crop systems was slightly taller and produced more tillers and grain (Table 13), especially for tillers and grain produced with conventional tillage in the four-crop rotation (Table 12).

Alfalfa production from newly established stands was not directly measured. Good stands were obtained but it was more challenging to do in the no till system, which was reseeded in late July. These seedlings were clipped a few times during the season to help control weeds.

Tillage comparisons for all corn-soybean rotations indicate that corn yields were similar even though the ridge-tilled system had a lower plant population and test weight than when conventionally tilled (Table 7). No-tilled corn also had lower test weight and was wetter at harvest than conventionally tilled corn. Soybean production was similar among two-crop systems regardless of the type of tillage practice used, including ridge till (Table 11).

Table 4. Effects of tillage and crop rotation systems on conventional and no-till corn production. Southeast Research Farm; Beresford, SD; 2001.

Rotation [1]	Tillage	Plant Population	Grain Yield [2]	Moisture Content	Test Weight
		plants/ac	bu/ac	%	lb/bu
C-S	NT	23,900[3]	153	18.8	55.4
	CT	25,700	145	17.2	56.2
C-S-W	NT	22,300	156	18.8	55.7
	CT	23,400	158	18.5	56.2
C-S-W+A	NT	21,300	162	18.8	56.1
	CT	24,300	153	18.1	56.3
Avg.		23,500	155	18.4	56.0
$LSD_{0.10}$		NS	NS	NS	NS
CV, %		10.31	6.23	3.03	0.91

[1] 2000 Crop: C-S = soybean, C-S-W = wheat, and C-S-W+A = alfalfa
[2] Grain yield at 15% moisture and 56 lb/bu test weight, harvested October 11, 2001
[3] Mean values each based on four observations.

Table 5. Crop rotation effect on conventional and no-till corn production. Southeast Research Farm; Beresford, SD; 2001.

Rotation [1]	Plant Population	Grain Yield [2]	Moisture Content	Test Weight
	plants/ac	bu/ac	%	lb/bu
C-S	24,800[3]	149	18.0	55.8
C-S-W	22,800	157	18.7	56.0
C-S-W+A	22,700	158	18.5	56.2
$LSD_{0.10}$	NS	NS	NS	NS

[1] 2000 Crop: C-S = soybean, C-S-W = wheat, and C-S-W+A = alfalfa
[2] Grain yield at 15% moisture and 56 lb/bu test weight, harvested October 11, 2001
[3] Mean values each based on eight observations

Table 6. Tillage effect on conventional and no-till corn production. Southeast Research Farm; Beresford, SD; 2001.

Tillage[1]	Plant Population	Grain Yield [2]	Moisture Content	Test Weight
	plants/ac	bu/ac	%	lb/bu
NT	22,500[3]	157	18.8	55.7
CT	24,500	152	17.9	56.2
$LSD_{0.10}$	1,800	NS	0.4	0.4

[1] 2000 Crop: C-S = soybean, C-S-W = wheat, and C-S-W+A = alfalfa
[2] Grain yield at 15% moisture and 56 lb/bu test weight, harvested October 11, 2001
[3] Mean values each based on 12 observations

Table 7. Ridge-till effect on corn production in corn-soybean rotation. Southeast Research Farm; Beresford, SD; 2001.

Tillage [1]	Plant Population	Grain Yield [2]	Moisture Content	Test Weight
	plants/ac	bu/ac	%	lb/bu
NT	23,900[3]	153	18.8	55.4
RT	22,500	149	18.1	55.5
CT	25,700	145	17.2	56.2
Avg.	24,000	149	18.0	55.7
$LSD_{0.10}$	NS	NS	0.9	NS
CV, %	8.71	4.09	3.82	0.96

[1] 2000 Crop: soybean
[2] Grain yield at 15% moisture and 56 lb/bu test weight, harvested October 11, 2001
[3] Mean values each based on four observations

Table 8. Effects of tillage and crop rotation systems on conventional and no-till soybean production. Southeast Research Farm; Beresford, SD; 2001.

Rotation [1]	Tillage	Plant Height	Plant Population	Grain Yield [2]	Moisture Content	Test Weight
		inches	plants/ac	bu/ac	%	lb/bu
C-S	NT	32.4	107,000[3]	44	10.1	57.5
	CT	33.1	114,000	44	9.9	57.4
C-S-W	NT	32.7	127,000	44	9.9	57.4
	CT	33.1	115,000	41	9.9	57.5
C-S-W+A	NT	34.8	114,000	47	10.2	57.5
	CT	33.1	126,000	43	10.1	57.6
Avg.		33.2	117,000	44	10.0	57.5
$LSD_{0.10}$		NS	NS	3	NS	NS
CV, %		3.56	11.57	4.44	1.29	0.29

[1] 2000 Crop: corn
[2] Grain yield at 13% moisture and 60 lb/bu test weight, harvested October 1, 2001
[3] Mean values based on four observations

Table 9. Crop rotation effect on conventional and no-till soybean production. Southeast Research Farm; Beresford, SD; 2001.

Rotation [1]	Plant Height	Plant Population	Grain Yield [2]	Moisture Content	Test Weight
	inches	plants/ac	bu/ac	%	lb/bu
C-S	32.7	111,000[3]	44	10.0	57.4
C-S-W	32.9	121,000	43	9.9	57.4
C-S-W+A	33.9	120,000	45	10.1	57.6
LSD $_{0.10}$	NS	9,000	NS	NS	NS

[1] 2000 Crop: corn
[2] Grain yield at 13% moisture and 60 lb/bu test weight, harvested October 1, 2001
[3] Mean values are based on eight observations

Table 10. Tillage effect on conventional and no-till soybean production. Southeast Research Farm; Beresford, SD; 2001.

Tillage[1]	Plant Height	Plant Population	Grain Yield [2]	Moisture Content	Test Weight
	inches	plants/ac	bu/ac	%	lb/bu
NT	33.3	116,000[3]	45	10.1	57.4
CT	33.1	118,000	42	10.0	57.5
LSD $_{0.10}$	NS	NS	1	0.1	NS

[1] 2000 Crop: corn
[2] Grain yield at 13% moisture and 60 lb/bu test weight, harvested October 1, 2001
[3] Mean values each based on 12 observations

Table 11. Ridge-till effect on soybean production in corn-soybean rotation. Southeast Research Farm; Beresford, SD; 2001.

Tillage [1]	Plant Height	Plant Population	Grain Yield [2]	Moisture Content	Test Weight
	inches	plants/ac	bu/ac	%	lb/bu
NT	32.4	107,000[3]	44	10.1	57.5
RT	31.8	109,000	42	9.9	57.4
CT	33.1	114,000	44	9.9	57.4
Avg.	32.4	110,000	43	10.0	57.4
$LSD_{0.10}$	NS	NS	NS	NS	NS
CV, %	4.00	15.04	4.23	1.40	0.36

[1] 2000 Crop: corn
[2] Grain yield at 13% moisture and 60 lb/bu test weight, harvested October 1, 2001
[3] Mean values each based on four observations

Table 12. Effects of tillage and crop rotations on conventional and no-till spring wheat production. Southeast Research Farm; Beresford, SD; 2001.

Rotation [1]	Tillage	Plant Height	Tillers	Grain Yield [2]	Moisture Content	Test Weight
		inches	no/ft^2	bu/ac	%	lb/bu
C-S-W	NT	37.8[3]	54	57	11.5	59.0
	CT	37.7	52	60	11.4	58.8
C-S-W+A	NT	39.6	55	61	11.4	59.0
	CT	38.1	61	66	11.6	59.4
Avg.		38.3	55	61	11.5	59.0
$LSD_{0.10}$		NS	5	5	NS	NS
CV, %		2.77	5.46	6.08	1.28	0.76

[1] 2000 Crop: soybean
[2] Grain yield at 13.5% moisture and 60 lb/bu test weight, swathed July 20; harvested August 7
[3] Values are means based on four observations

Table 13. Crop rotation effect on conventional and no-till spring wheat production. Southeast Research Farm; Beresford, SD; 2001.

Rotation [1]	Plant Height	Tillers	Grain Yield [2]	Moisture Content	Test Weight
	inches	no/ft^2	bu/ac	%	lb/bu
C-S-W	37.8[3]	53	59	11.5	58.9
C-S-W+A	38.9	58	64	11.5	59.2
LSD $_{0.10}$	0.9	3	4	NS	NS

[1] 2000 Crop: soybean
[2] Grain yield at 13.5% moisture and 60 lb/bu test weight, swathed July 20; harvested August 7
[3] Values are means based on eight observations

Table 14. Tillage effect on conventional and no-till spring wheat production. Southeast Research Farm; Beresford, SD; 2001.

Rotation [1]	Plant Height	Tillers	Grain Yield [2]	Moisture Content	Test Weight
	inches	no/ft^2	bu/ac	%	lb/bu
NT	38.7[3]	54	58	11.5	59.0
CT	37.9	56	63	11.5	59.1
LSD $_{0.10}$	NS	NS	4	NS	NS

[1] 2000 Crop: soybean
[2] Grain yield at 13.5% moisture and 60 lb/bu test weight, swathed July 20; harvested August 7
[3] Values are means based on eight observations.

Grain Nutrient Composition

Dry matter nutrient content for grain harvested is summarized in Table 15. Protein contents averaged 9.2% for corn, 33.9% for soybean, and 16.2% for wheat with ranges of nearly 1 to 3% among these crops. Protein yields were nearly 1,000 lb/ac for corn and soybean and 650 lb/ac for wheat this season. Oil contents averaged 3.7% for corn and 20.5% for soybean with ranges of 0.7 and 1.5, respectively. Oil yields were 400 lb/ac for corn and 600 lb/ac for soybean. Corn starch content averaged

72.4% (4 ton/ac), lysine content averaged 0.301% (33 lb/ac), and non-ruminant metabolizable energy averaged 1759 kcal/lb (19,314 Mcal/ac).

Table 15. Grain quality and dry matter yield[1]; Southeast Research Farm; Beresford, SD; 2001.

	Wheat	- - - Soybean- - -		- - - - - - - - - - - - - Corn - - - - - - - - - - - - - -				
	Protein	Protein	Oil	Protein	Oil	Starch	Lysine	ME[2]
	%	%	%	%	%	%	%	Kcal/lb
Average	16.2	33.9	20.5	9.2	3.7	72.4	0.301	1759
Maximum	17.4	35.6	21.2	9.7	4.0	73.3	0.308	1769
Minimum	14.6	32.6	19.7	8.8	3.3	71.5	0.292	1746
Range	2.7	3.0	1.5	0.9	0.7	1.8	0.016	23
Std. Dev.	0.8	0.7	0.4	0.2	0.2	0.4	0.004	6
DM Yield, lb/ac	657	990	599	1,015	401	7,950	33	19,314[3]

[1] Dry Matter (DM) basis (corn grain lab DM = 87.8%, based on 28 observations; soybean grain lab DM = 94.2%, based on 28 observations; spring wheat grain lab DM = 87.7%, based on 16 observations)
[2] ME = non ruminant metabolizable energy
[3] Mcal/ac

Economics

Market prices were quite low again this year, especially for row crops. Grain yields for some systems may be good enough to be profitable or at least break even when the remaining variable and fixed costs are included to derive net incomes and production costs. Market price for wheat actually exceeded the loan rate. Not being able to market hay reduced profitability of the four-crop systems and will result in negative net incomes.

Tables 16 to 18 summarize the economic returns for this trial using market and loan prices. Interactions between tillage methods and crop rotations for each system on a whole farm basis and for each crop are reflected in Table 16. Main effects of rotation and tillage are summarized together in Table 17. Tillage effects for the three corn-soybean rotations, including ridge-till are shown in Table 18.

Market Prices

Whole farm economic returns averaged nearly $80/ac and ranged from $17 to 107/ac for these systems. Average returns were very similar among the three crops harvested for grain at $112 to 116/ac, but alfalfa in these systems lost an average of - $135/ac (Table 16). Whole farm return differed greatly by rotation. Two- and three-crop systems had returns of nearly $100/ac, but reestablishing alfalfa caused returns for the four-crop systems to drop by a average of nearly $60/ac (Table 17). Conventionally tilled whole farm systems were generally more profitable than no-till systems, but crop rotation effects varied depending on how they were tilled. Economic return was similar between the two- and three-crop rotations when they were conventionally tilled, but when they were no-tilled the two-crop rotations had about $10/ac more return than the three-crop systems.

Average economic return for the corn grown in these systems was $112/ac and ranged from $63 to 158/ac. Conventionally tilled corn was consistently more profitable than NT corn by an average of $50/ac. Corn in three-crop rotations had greater economic return than corn in the other two rotations, but the rotation effect was not consistently observed between the types of tillage practices. Three-crop corn was always in the top return group. But when corn was produced with no-till management, the four-crop rotation had the lowest return; and the two-crop rotation had the lowest return for corn when it was conventionally tilled.

Economic return for soybean averaged $114 and ranged from $107 to 121/ac. Crop rotations and tillage practices did not seem to significantly affect soybean economic returns.

Wheat economic return averaged $116/ac and ranged from $101 to 134/ac. Conventionally tilled wheat returned an average of $18/ac more than no-tilled wheat. Four-crop system returns were $24/ac greater than three-crop systems for wheat. Fresh weight protein concentrations were low enough to incur minor dockage in approximately 35% of the plots at levels ranging from $0 to 1/ac.

Seed and fertilizer costs for alfalfa were allocated to this year without prorating the expenses throughout the projected life of the stand. Without any forage to sell the economic return for alfalfa lost an average of -$135/ac. Economic return for conventionally tilled alfalfa was -$84/ac and in the no-till system where it was twice seeded it lost -$187/ac.

The ridge-till system behaved similar to the no-till system in terms of economic return. Both the ridge-till and no-till systems were consistently less profitable than the conventionally tilled system for corn and soybean (Table 18).

Loan Rates

Using government loan prices for grain crops added an average of $33/ac to the economic returns for these whole farm systems (Table 16). Economic return based on loan rates added $17/ac for corn and $50/ac for soybean, but reduced the return for wheat by $17/ac because the market price for wheat at harvest exceeded the loan rate briefly this year. As a result, the best way to maximize economic returns for this project in 2001 would be to sell wheat for the market price at harvest and corn and soybean at their loan rates.

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Table 16. Cropping system partial net economic return comparisons among conventional and no-till crops. Southeast Research Farm; Beresford, SD; 2001.

	System	1	2	3	4	5	6	Pooled		
	Rotation	CS		CSW		CSW+A		Avg.	LSD[1] $_{0.10}$	CV, %
	Tillage	NT	CT	NT	CT	NT	CT			
		-----------------------$/ac--------------------------								
Whole Farm	Market	97	107	88	105	17	59	79	8	7.65
	Loan	130	140	120	140	45	92	112	11	7.43
Corn	Market	86	108	100	158	63	153	112	19	12.88
	Loan	104	124	118	176	82	171	129	20	11.95
Soybean	Market	107	121	109	109	121	119	114	NS[2]	6.64
	Loan	157	170	159	156	175	168	164	NS	6.00
Wheat	Market	NA[3]	NA	101	117	113	134	116	NS	9.08
	Loan	NA	NA	84	100	95	115	99	NS	9.60
Alfalfa	Market	NA	NA	NA	NA	-187	-84	-135	NA	NA

[1] LSD Values are for comparing means within a row
[2] NS = Not significant
[3] NA = Not applicable

Table 17. Crop rotation and tillage effects on partial net economic return for conventional and no-till crops. Southeast Research Farm; Beresford, SD; 2001.

	Rotation	CS	CSW	CSW+A	LSD[1] 0.10	- - - - -Pooled - - - - -		
	Tillage	- - - - - - Pooled - - - - - - -				NT	CT	LSD[1] 0.10
		- $/ac -						
Whole Farm	Market	102	97	38	8	67	90	5
	Loan	135	132	68	11	98	125	6
Corn	Market	97	129	108	19	83	140	11
	Loan	114	147	126	20	101	157	12
Soybean	Market	114	109	120	8	112	116	NS[2]
	Loan	164	151	171	11	164	165	NS
Wheat	Market	NA[3]	109	123	10	107	125	10
	Loan	NA	92	105	9	90	107	9
Alfalfa	Market	NA	NA	-135	NA	-187	-84	NA

[1] LSD Values are for comparing means within a row
[2] NS = Not significant
[3] NA = Not applicable

Table 18. Ridge-till effects on partial net economic return among two-crop rotations. Southeast Research Farm; Beresford, SD; 2001.

Crop	Rotation	- - - - - - - - - - - - - - - - - - CS - - - - - - - - - - - - - - - - -					
	Tillage	NT	RT	CT	Avg.	LSD[1] 0.10	CV, %
Corn	Market	86	89	108	94	14	10.72
	Loan	104	106	124	111	15	9.64
Soybean	Market	107	101	121	110	10	6.52
	Loan	157	149	170	159	13	5.84

[1] LSD Values are for comparing means within a row

SE FARM REPORT
SDSU

LONG TERM PROFITABILITY OF TILLAGE AND CROP ROTATIONS FOR SOUTHEAST SOUTH DAKOTA

Doug Franklin and Robert Berg

Economics 0102

Since 1991, The Southeast South Dakota Research Farm has conducted tillage and rotation cropping studies with a primary design to evaluate the production and economics associated with conventional versus no-till using two-, three-, and four-crop rotations. The Annual Progress Reports since 1991 have reported on the year to year results of production and economics. This article evaluates the cumulative economic results over the last nine years for the two-and three-crop rotation systems and five years of the four-crop rotation.

Long term economic analysis of agricultural production and cost data of the project assists farm operators in determining the most profitable rotation and tillage system in terms of net income and income stability. Modifications of the crop production systems as reported in the Annual Reports, were made to reflect typical production on southeast South Dakota farms. These adjustments included establishing total cultivated area at 497 acres; modifying crop acreages in the different rotations to reflect typical practice; including management time and expense; and adjusting labor time to reflect more accurately operator labor time in crop production.

A cursory synopsis of the seven production systems is two-crop corn-soybean rotation using no-till, ridge-till and conventional tillage systems; a three-crop corn-soybean-small grain soybean rotation using no-till and conventional tillage systems; and a four-crop corn-soybean-small grain rotation for no-till and conventional tillage systems with a perennial alfalfa stand. The economic data for the production and rotations systems are evaluated and analyzed for long term profitability. The economic analysis included all costs (cash and non-cash expense) and cash only basis. The non-cash expenses included items such as depreciation and management charges. Long-term economic analysis determined the greatest overall net income and least variability in annual net income.

ECONOMIC ANALYSIS RESULTS

Every cropping system experienced negative to positive net income fluctuations from year to year. This is expected given the many factors that impact production, such as variations in weather, yield, product prices, input prices, crop quality adjustments, etc. Analysis of the cash market product prices and crop production yields reflected the wide disparity. Fluctuations in cash market product prices in corn ranged from $1.38 to $2.80 per bushel, for soybeans from $4.16 to $6.80 per bushel, and alfalfa from $55 to $95 per ton. The low range in market prices occurred in five out of nine years for corn and four out of nine years for soybeans and four out of five years for alfalfa. The yields for corn ranged from 68 to 179 bushels per acre, for soybeans ranged from 29 to 53 bushels per acre, and for alfalfa from 1.9 to 5.6 tons per acre. A common variable for low total revenue per acre for any system is the cash price. Higher than average yields would not offset the low prices. Conversely, higher cash prices did not offset low yields. Thus, a primary reason for low net incomes in the analysis was due to low market prices at harvest for crops and not the tillage or rotation practice.

In general, a specific management practice, tillage or rotation, had a minor impact on net incomes. The impact of a particular system having a higher cost in general compared to another system would reduce net incomes or vice versa. But, the inclusion of the small grain production had a negative impact on net revenues. The primary reason was due to very low acres in production in the analysis. This caused the average costs per acre to be higher because the costs are spread over too few acres. Farm systems that produce small grains on a large number of acres can spread out the fixed costs over more acres. Therefore, the cost per acre is smaller for those operations.

All seven rotation-tillage systems had negative cumulative net incomes over the time period of study. The systems with the smallest negative cumulative net incomes were the four-crop no-till rotation and the two-crop no-till rotation. The net farm incomes were -$18,971 for the four-crop no-tillage rotation and -$20,333 for the two-crop no-till rotation. The two-crop ridge-till system generated the largest negative cumulative net income of -$45,198. Both of the three-crop systems also had large negative net incomes. Continued low crop product prices and decent crop yields will result in negative net farm incomes for most systems. This means that the cumulative long-term negative net incomes will become even more negative.

For any type of business, the most economical rotation and tillage would include only the profitable systems. In the last five years, on an annual basis, one time period returned a large positive net income, two annual time periods were break even net incomes, and two of the annual time periods generated large negative net incomes. The two negative annual net incomes more than offset the one positive annual net income. What this means is the uncertainty and unpredictability in market prices from year to year plays a large role in determining long-term profitability of farming.

Many farm operations include other diversified production alternatives, thus, the operation could absorb losses in a system from positive net returns in another system. However, even if an operation has positive net returns in another system, it must critically account for the large negative long-term net incomes from the non-positive systems.

CASH NET INCOME RESULT

Note that all systems had cumulative negative net incomes over their time periods. The net incomes included cash and non-cash expenses. Analysis of cash only expenses showed all seven systems generated positive net **cash** income cumulative over the respected time periods (nine years for the two and three crop systems and five years for the four-crop system). Both the no-till two crop and four crop rotations had the largest positive net annual cash incomes with the two crop exceeding $11,000 average per year and the four crop exceeding $20,000 average per year. Specific crop sales in the last two years did not generate sufficient income to pay for variable cash expenses for most of the seven cropping systems.

Thus, even though every system has a positive net cash flow through the respective time period, as all costs are accounted for in a business, all systems generated negative flows. The two systems that stood out the most with the largest positive net cash income and least cost net income were the no-tillage two crop rotation (corn-soybean) and no-tillage four crop rotation (corn-soybean-small grain-alfalfa).

WHAT DOES THIS MEAN?

Farming is a no win situation with respect to accounting for all cost explicit and implicit, and cash and non-cash. But, farming does have a positive net return with respect to cash income and cash expenses. One part of the analysis only included the local cash market price of the crops in question. The analysis ignored any government program benefits and loan prices. Including government loan prices will add significantly to the net incomes of all systems. However, as all costs are accounted for, under the limited scope of the production management alternatives of this study, no-till production seems to be a production technology to consider in order to minimize losses.

The long-term alternative discussed here will continue as long as the Southeast Research Farm continues the tillage and crop rotation study.

EFFECT OF CROP ROTATION AND TILLAGE ON NEMATODE POPULATIONS

J.D. Smolik

Plant Science 0103

Soil samples were collected in the spring and fall of 2001 from all crops in replications one and three of the Crop Rotation Tillage Study located at the Southeast Farm. Nematodes were extracted from soil by the Christie-Perry method, identified, and counted. The first six taxa listed in Tables 1 and 2 include the plant parasites, the next taxonomic grouping (dorylaims) are primarily predaceous, and the last group (microbial feeders) are associated with decaying organic material. The latter two taxa are generally considered beneficial. Predaceous nematodes aid in regulating populations of other soil animals including plant parasitic nematodes. The microbial feeders aid in breaking down crop residues and recycling nutrients.

Tillage appeared to have little consistent effect on numbers of plant parasitic nematodes (Tables 1 and 2). However, populations of predaceous and microbial feeding nematodes were substantially higher in the conventionally tilled rotations. Numbers of stunt, pin, and Tylenchinae likely did not reach damaging levels on any crop. Spiral nematode numbers above 1000 per 100 cm^3 of soil probably cause some plant damage and fall population densities exceeded this amount on several crops (Table 2). Dagger nematode numbers above 100 per 100 cm^3 soil have been associated with significant crop yield reductions, and it appears likely that the corn in both the NT4 and CT4 rotations was damaged by dagger nematodes. The higher dagger nematode numbers in these rotations apparently are a result of having alfalfa in these rotations. The alfalfa was reseeded this year and the old stand was planted to corn, thus the high dagger nematode counts. Because alfalfa is not an integral part of these rotations in most years it is likely that numbers are usually more similar to those in the NT3 and CT3 rotations. Also, younger alfalfa stands will generally have lower numbers of dagger nematodes. Lesion nematode population levels were moderate, but may have caused some damage to corn in most rotations except the NT4 and CT4. It will be useful to continue nematode population measurements in subsequent years of this study.

Table 1. Spring nematode populations; May 29, 2001

		Nematode Taxa, number/100cm^3							
Rotation	Crop	Stunt	Spiral	Pin	Tylenchinae	Dagger	Lesion	Dorylaims	Microbial feeders
NT2	Corn	67	360	110	42	42	25	42	432
	Soybean	0	758	118	85	0	135	110	460
RT2	Corn	42	706	401	218	25	0	160	625
	Soybean	16	616	92	60	16	0	16	333
CT2	Corn	16	675	676	185	0	35	62	1416
	Soybean	0	460	260	42	0	42	35	566
NT3	Corn	0	42	150	0	50	0	16	250
	Soybean	0	475	92	0	125	16	110	626
	Sp. Wht.	0	485	16	85	0	0	0	415
CT3	Corn	42	185	16	100	0	0	150	951
	Soybean	0	610	110	16	25	16	65	700
	Sp. Wht.	293	360	185	162	0	0	475	2376
NT4	Corn	0	16	158	42	225	0	92	308
	Soybean	42	1450	62	25	25	0	233	725
	Sp. Wht.	16	441	543	50	0	0	185	1216
	Alfalfa	125	275	235	142	0	0	162	516
CT4	Corn	0	16	1160	85	368	0	468	2966
	Soybean	16	951	193	142	25	0	208	916
	Sp. Wht.	92	908	3633	285	25	0	641	1941
	Alfalfa	16	243	135	142	0	0	160	1058

Table 2. Fall nematode populations; October 29, 2001

Rotation	Crop	Stunt	Spiral	Pin	Tylenchinae	Dagger	Lesion	Dorylaims	Microbial feeders
		Nematode Taxa, number/100 cm^3							
NT2	Corn	0	1443	62	42	42	243	175	760
	Soybean	0	858	60	16	0	16	110	1150
RT2	Corn	16	2483	358	110	60	142	118	710
	Soybean	0	1441	193	150	16	42	168	1440
CT2	Corn	25	1085	110	385	0	741	515	1083
	Soybean	0	760	175	16	0	42	168	1085
NT3	Corn	67	200	143	92	0	35	75	360
	Soybean	0	1541	67	168	16	16	327	1533
	Sp. Wht.	0	235	0	110	0	0	135	525
CT3	Corn	0	2526	216	167	16	168	351	1116
	Soybean	0	185	85	62	62	16	193	1291
	Sp. Wht.	162	350	50	160	62	62	210	1176
NT4	Corn	0	42	62	132	443	0	326	1176
	Soybean	0	2466	16	16	0	16	110	541
	Sp. Wht.	0	916	0	25	62	0	116	326
	Alfalfa	42	293	276	35	162	0	215	1400
CT4	Corn	0	16	260	35	442	0	325	841
	Soybean	0	185	526	100	158	0	225	1341
	Sp. Wht.	0	1235	951	162	116	16	300	1100
	Alfalfa	175	85	1476	118	62	16	85	891

SE FARM REPORT
SDSU

CORN SEED COAT POLYMERS

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Southeast Farm 0104

SUMMARY

Conditions were favorable for planting corn during mid April in this field, then became challenging for the remainder of the planting season due to abundant spring rains. This seems like a good opportunity to test whether seed polymer coatings might benefit corn production in our climate. Benefits associated with this technology are not clearly evident so far based on these preliminary research results. Instead several detrimental trends were seen such as delayed seedling emergence when planted in mid May and a small penalty for using it where it might not be needed of about $5 to 10/ac.

Establishing a full-season hybrid on an upland field when conditions are suitable in mid to late April has the best probability of producing a profitable corn crop. Seed polymer technology may provide better protection or prove useful under other conditions.

INTRODUCTION

Planting seeds into cold damp soils can subject them to embryo or seedling injury. Cold temperatures, diseases, or other factors can weaken crops during germination and emergence in the northern Great Plains. Various polymers are being marketed that regulate the water or temperature regime of seed after planting. This should allow producers to safely plant earlier in the spring with less risk from cold injury because polymer coatings are intended to protect the seed and prevent sprouting until field conditions are suitable for emergence.

This experiment was conducted to test if this technology enhances corn production and is economically feasible in our area. These findings summarize a few preliminary highlights based on one year's field results. Our final conclusions may vary depending on the outcome of further analysis.

METHODS

This study was designed to test various levels of seed protection using multiple corn hybrids established at different planting dates. A seed distributor applied two polymer coatings to separate batches of corn seed and provided the same seed uncoated for two hybrids adapted to our area. These were each planted at early and normal planting dates at our station.

A total of six treatments per planting date were established as a split-plot design with four replications of each combination. Main plots were planting dates with hybrid and polymer combinations randomly assigned as subplots in a field managed as a no-till corn-soybean rotation. Each subplot consisted of six rows planted on 30-inch centers that were approximately 80 ft long. Time of final seedling emergence (VE) and beginning silk (R1) were monitored at three- to four-day intervals by counting individual plants in the two middle rows in each subplot (50 ft^2) and reported as days after planting (DAP). Vegetative stage, expressed as the average number of mature collars, was recorded several weeks after final seedling emergence. First generation European corn borer pressure was monitored in early to mid July and recorded as the number of shot-holed plants per 50 ft^2.

Plant population is based on stand counts taken at silking. Grain yield, moisture content, and test weight were measured at harvest. Net economic return is based on the fresh weight yield for corn marketed during harvest at $1.73/bu after subtracting variable input costs for seed, fertilizer, herbicide, and moisture dockage (at $0.05/bu per point of grain moisture greater than 15%). An added cost for polymer-coated seed was assessed at $25/bag. Other management factors are outlined in Table 1.

Table 1. Management practices for polycoated corn seed study. Southeast Research Farm; Beresford, SD; 2001.

Previous Crop	Soybean
Tillage System	No-till
Seed Coatings	A = standard polymer B = improved polymer UTC = untreated control
Hybrids (relative maturity, days)	Fielders Choice 8809 (108 - 110) Fielders Choice 8401 (101 - 103)
Fertilizer; N-P_20_5-K_20, lb/ac (source)	160-0-0 (as 28-0-0), side dressed
Herbicide	Dual+Bladex+Roundup; PRE, EPP Buctril, Post
Dates Planted	April 19 & May 14
Dates Sampled • **Seedling emergence** **planted April 19 (V stage)** **planted May 14 (V stage)** • **Reproductive growth stages(VT & R1)** **planted April 19** **planted May 14)**	 May 2 to 19 (June 12) May 21 to June 11 (June 21) July 10 to 26 July 23 to August 3
Date Harvested	October 22

RESULTS AND DISCUSSION

Mid April was the earliest that soil conditions were suitable to plant corn in our field this year. Spring air temperatures in March were five to seven degrees below normal, but were typical (zero to three degrees above normal) during April and May. A prolonged stretch of rainy weather after we planted in April provided twice the normal precipitation for the month (nearly three inches more). This made it impossible to plant again in this part of the field until mid May.

Soil conditions for planting were good to excellent in mid April, but were poorer in mid May. A rotary hoe was used to help improve soil surface conditions for planting within a day before the May seeding. Some soil crusting and open slots were observed at planting for a few rows at the second date. All seed used in this study planted well with our White 5700 planter.

Even though early spring precipitation was excessive, the crop was later moderately to severely moisture stressed several times during the season. Good rains in late July provided adequate moisture for average grain yield. Weed control was very good in this trial. The crop also dried down well in the fall and had good test weight (Table 2).

Planting dates and hybrids generally had more impact on corn production than seed coatings in this study (Tables 3-5). A few crop responses were observed due to the polymer coatings or their interactions with other factors; however, these were usually relatively minor or showed negative trends.

Emergence and Silking

Germination and emergence are the first stages we would expect to see polymer coatings protect the crop. Seed planted in April began emerging less than two weeks after planting and was essentially done by 20 DAP. All seed appeared to emerge about the same time with no significant differences measured between hybrids or seed coatings.

However, polymer coatings delayed emergence when planted in May. Uncoated seed began emerging within the first week and was practically finished two weeks after planting. It took coated seed nearly 10 DAP to start emerging and wasn't fully emerged until about three weeks after planting (Figure 1).

Cold stress symptoms were observed as a light colored band in the whorl of some plants shortly after emergence (V1 - V3 stage), especially for the earlier planted seed. A few of these seedlings became stunted and some even died, but it seemed to have little or no major effect on corn production in this field. Minor spacing trends as seedling doubles within a row were also noted during

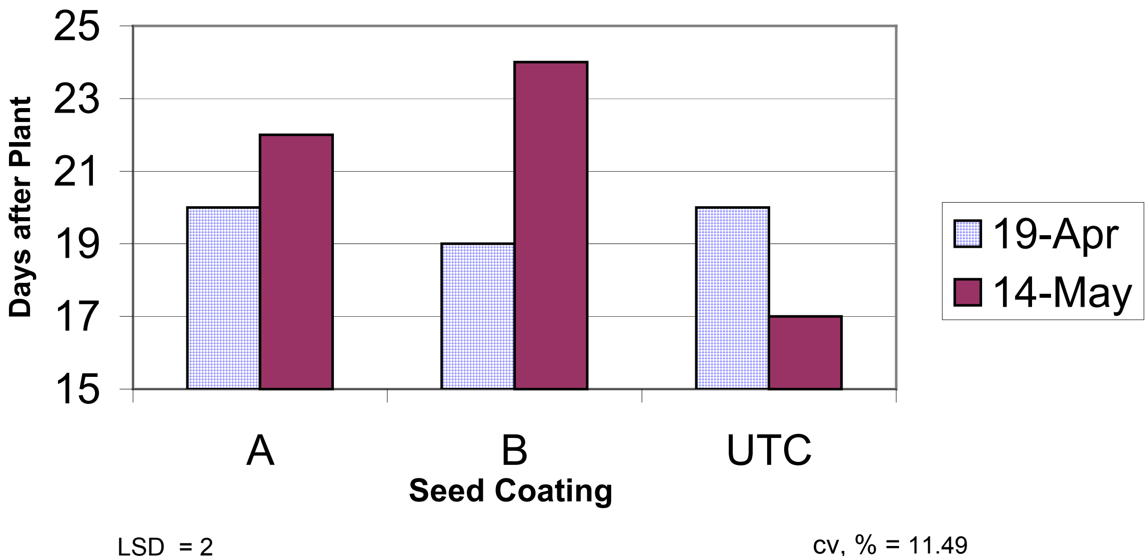

Figure 1. Planting date and seed coating effect on corn emergence regardless of hybrid. Southeast Research Farm; Beresford, SD; 2001.

emergence. This was also relatively minor and seemed to be associated a little more with the short-season hybrid (8401) and polymer coating A.

While good stands were established at both planting dates, population overall was reduced about 10% when planted in mid May (Table 4). The short-season hybrid (8401) had lower seedling vigor because less of its uncoated seed survived when planted in May than in April compared to the full-season hybrid (8809) that survived well at both planting dates (Table 2). Population declines of up to 5,000 plants/ac were noted for the May planting date in some cases.

Four weeks after final emergence corn planted in April had approximately six collars (V6) regardless of whether the seed was coated or not. However, a little more than two weeks after final emergence corn planted in mid May already had five collars (V5). Uncoated seed was about a half a collar ahead of those with polymer coatings, but only when planted in mid May.

Field scouting indicated shot holes in the whorls of some plants caused by first-generation European corn borer in early to mid July. The number of affected plants ranged from 0 to about 10% of the population and was a little higher in the earlier planted corn. Few if any live larvae were detected in corn immediately adjacent to these research plots in the same field, so control measures were not applied.

Mature tassels (VT) were first detected about 80 DAP and were the dominant stage by 90 DAP for seed planted in April. This was about two weeks longer than it took seed planted in May to reach the same stage. Silks (R1) generally appeared two or three days later. Reproductive stages occurred nearly one to four days earlier in the in the short-season than in the full-season hybrid. Minor delays in tassel and silk formation were still detectable at a few sample dates, but did not appear to have much affect on corn production by the end of the season. Half to two-thirds of the plants on hybrid 8401 formed multiple ears per stalk during the transition from the silking (R1) to kernel blister stage (R2). This trait was observed on very few of hybrid 8809's plants.

Production and Economics

Grain yield averaged just under 150 bu/ac and was generally better for the full-season hybrid (Table 4). Moisture dockage at harvest was negligible except when planting the full-season hybrid in mid May. Test weight was heavier when planted in April and for the full-season hybrid.

The next question becomes whether the extra cost of buying seed coated with these polymers is cost effective. Averaged across all factors the net return was actually nearly $5 to 10/ac less when polymer seed coatings were used. There was little if any evidence that this technology would benefit producers raising corn under the field conditions we experienced.

ACKNOWLEDGEMENTS

Partial funding for this project was provided by Landec Ag, Inc.; Monticello, IN.

Table 2. Effect of planting date, hybrid, and seed coating on corn production. Southeast Research Farm; Beresford, SD; 2001.

Planting Date	Hybrid	Seed Coating	Final Emergence	Early Silk	Plant Population	Grain Yield [1]	Moisture Content	Test Weight	Economic Return [2]
			DAP [3]	DAP	plants/ac	bu/ac	%	lb/bu	$/ac
Apr 19	8809	A	20 [4]	88	28,100	156	15.1	57.7	127
		B	19	88	28,100	159	15.0	58.9	135
		UTC	19	88	26,800	150	15.1	58.2	126
	8401	A	20	86	26,400	153	13.4	57.2	123
		B	18	86	26,800	150	13.7	57.6	117
		UTC	20	86	27,200	150	13.4	57.3	126
May 14	8809	A	21	76	23,300	145	17.8	55.5	100
		B	24	74	24,200	147	17.3	55.5	105
		UTC	18	73	25,700	155	17.0	55.7	127
	8401	A	23	72	24,600	140	15.0	54.8	101
		B	24	73	25,300	141	15.2	54.6	103
		UTC	17	71	24,200	135	14.0	55.2	102
Avg.			20	80	25,900	148	15.1	56.5	116
LSD $_{(0.10)}$			NS	NS	1,800	NS	NS	NS	NS
CV, %			11.49	2.11	5.81	7.11	5.06	1.08	15.29

[1] Grain yield at 15% moisture content and 56 lb/bu test weight.
[2] Based on $1.73 bu less moisture dock ($0.05/point), seed, fertilizer, and herbicide costs (FWT basis).
[3] DAP = Days After Planting
[4] Values are means based on 4 observations

Table 3. Seed coating effect on corn production regardless of hybrid or date planted. Southeast Research Farm; Beresford, SD; 2001.

Seed Coating	Final Emergence	Early Silk	Plant Population	Grain Yield [1]	Moisture Content	Economic Return [2]
	DAP [3]	DAP	plants/ac	bu/ac	%	$/ac
A	21 [4]	80	25,600	149	15.3	113
B	21	80	26,100	149	15.3	115
UTC	18	80	26,000	148	14.9	120
LSD $_{(0.10)}$	1	NS	NS	NS	NS	NS

[1] Grain yield at 15% moisture content and 56 lb/bu test weight.
[2] Based on $1.73 bu less moisture dock ($0.05/point), seed, fertilizer, and herbicide costs (FWT basis).
[3] DAP = Days After Planting
[4] Values are means based on 16 observations

Table 4. Planting date effect on corn production regardless of hybrid or seed coating. Southeast Research Farm; Beresford, SD; 2001.

Planting Date	Final Emergence	Early Silk	Plant Population	Grain Yield [1]	Moisture Content	Economic Return [2]
	DAP [3]	DAP	plants/ac	bu/ac	%	$/ac
Apr 19	20 [4]	87	27,200	153	14.3	126
May 14	21	73	24,500	144	16.0	106
LSD $_{(0.10)}$	1	2	1,300	NS	1.8	NS

[1] Grain yield at 15% moisture content and 56 lb/bu test weight.
[2] Based on $1.73 bu less moisture dock ($0.05/point), seed, fertilizer, and herbicide costs (FWT basis).
[3] DAP = Days After Planting
[4] Values are means based on 24 observations

Table 5. Hybrid effect on corn production regardless of seed coating or date planted.
Southeast Research Farm; Beresford, SD; 2001.

Hybrid	Final Emergence	Early Silk	Plant Population	Grain Yield [1]	Moisture Content	Economic Return [2]
	DAP [3]	DAP	plants/ac	bu/ac	%	$/ac
8809	20 [4]	81	26,000	152	16.2	120
8401	20	79	25,700	145	14.1	112
LSD $_{(0.10)}$	NS	1	NS	5	0.4	9

[1] Grain yield at 15% moisture content and 56 lb/bu test weight.
[2] Based on $1.73 bu less moisture dock ($0.05/point), seed, fertilizer, and herbicide costs (FWT basis).
[3] DAP = Days After Planting
[4] Values are means based on 24 observations

Table 6. Planting date and seed coating effect on corn production regardless of hybrid.
Southeast Research Farm; Beresford, SD; 2001.

Planting Date	Seed Coating	Final Emergence	Early Silk	Plant Population	Grain Yield [1]	Moisture Content	Economic Return [2]
		DAP [3]	DAP	plants/ac	bu/ac	%	$/ac
Apr 19	**A**	20 [4]	87	27,200	155	14.3	125
	B	19	87	27,400	154	14.3	126
	UTC	20	87	27,000	150	14.3	126
May 14	**A**	22	74	24,000	143	16.4	101
	B	24	73	24,700	144	16.2	103
	UTC	17	72	24,900	145	15.5	102
LSD $_{(0.10)}$		2	NS	NS	NS	NS	NS

[1] Grain yield at 15% moisture content and 56 lb/bu test weight.
[2] Based on $1.73 bu less moisture dock ($0.05/point), seed, fertilizer, and herbicide costs (FWT basis).
[3] DAP = Days After Planting
[4] Values are means based on 8 observations

SE FARM REPORT
SDSU

DATE OF PLANTING CORN

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Southeast Farm 0105

SUMMARY

Research to monitor long-term effects of planting date and relative maturity on corn produced during 2001 is summarized in this report. Planting dates this year began on April 18 and ended on May 25. Corn responses obtained were fairly typical for this study with a couple of exceptions. Wet weather in April and early May reduced the survival of the short-season hybrid and its yield increased when planted in mid to late May. Grain yield averaged 139 bu/ac and ranged from 131 to 152 bu/ac. Planting late resulted in low test weight for both hybrids. Economic return differed greatly depending on when a hybrid with a given relative maturity was planted. The full-season hybrid was $15 to 30/ac more profitable planted in mid April to early May and the short-season hybrid was $25 to 60/ac more profitable planted in mid to late May.

Most grain nutrient levels were similar between hybrids this season. Average dry matter nutrient concentrations and yields were 4.1% and 380 lb/ac for oil, 9.5% and 873 lb/ac for protein, 71.6% and 6606 lb/ac for starch, 0.309% and 28 lb/ac for lysine, and 1,774 Kcal/lb and 16,346 Mcal/ac for non-ruminant metabolizable energy. Lysine concentration increased as planting date was delayed with the full-season hybrid.

RESULTS AND DISCUSSION

Precipitation between April 18 and May 8 was 4.35 inches. Corn was later moderately to severely moisture stressed several times during the season. Plant population was 24,500 plants/ac or 91% of intended seeding rate when averaged across all treatments (Table 2). Stands were better for the full-season hybrid when planted from mid April through early May. Apparently this spring's wet cool soils reduced seedling survival of the short-season hybrid and affected the amount of grain harvested in the fall. Visual symptoms of cold stress were observed shortly after emergence as light colored bands in seedling whorls in this trial and in an adjacent experiment (*Corn Seed Coat Polymers*, Southeast Farm 0104, page 28).

Reduced stands for the short-season hybrid at least partially accounts for yield differences seen between hybrids associated with the earlier planting dates. Yields for both hybrids typically fall with later plantings when their populations are similar. The short-season hybrid may also have tolerated the dry conditions in the middle of the season better. Relative yield was greatest when planted in early May (Table 3) and more grain was produced by individual plants for the short-season hybrid when averaged across all planting dates (Table 4).

Table 1. Management practices for date of planting corn study. Southeast Research Farm; Beresford, SD; 2001.

Previous Crop	Soybean
Tillage System	No-Till
Hybrids	DeKalb 512 (101 day RM) DeKalb 626 (112 day RM)
Seeding rate	26,900 seeds/ac
Weed Control	Dual + Bladex + Roundup, EPP & PRE; Accent, Post
Fertilizer (N-P2O5-K2O, lb/ac)	170-30-0 as 10-34-0 with seed; & 28-0-0 sidedress
Harvest Date	October 19

Moisture content of grain at harvest increased as it was planted later during the season and was consistently higher for the full-season hybrid. There was almost no moisture dock for the short-season hybrid, whereas dockage increased substantially when the full-season hybrid was planted after April. Test weight decreased as planting was delayed and was consistently better for the full-season hybrid. Both hybrids were docked for low-test weight when planted in late May this year.

The full-season hybrid was consistently more profitable when established from mid April through early May, but the short-season hybrid was more profitable when planted in mid to late May (Figure 1). This reflects the reduced survival of the short-season hybrid planted early with wet, cool conditions combined with lower yield and increased moisture dockage for the full-season hybrid planted late. When the most profitable planting date was compared for each hybrid the full-season one was still $10/ac more profitable than the short-season hybrid.

Grain quality in terms of nutrient compositions was relatively consistent among hybrids and planting dates in this study and is summarized in Table 5. The ranges between the highest and lowest concentrations observed on individual plots were approximately 0.5% for oil, 1.5% for protein and starch, 0.02% for lysine, and 50 Kcal/lb for non-ruminant metabolizable energy. Average nutrient contents were 4.1% oil, 9.5% protein, 71.6% starch, 0.309%

lysine, and 1,774 Kcal/lb non-ruminant metabolizable energy. Corresponding dry matter yields were 380 lb/ac for oil, 873 lb/ac for protein, 6,600 lb/ac for starch, 28 lb/ac for lysine, and 16,346 Mcal/ac for non-ruminant metabolizable energy. Lysine concentration in the full-season hybrid increased as its planting date was delayed (data not shown).

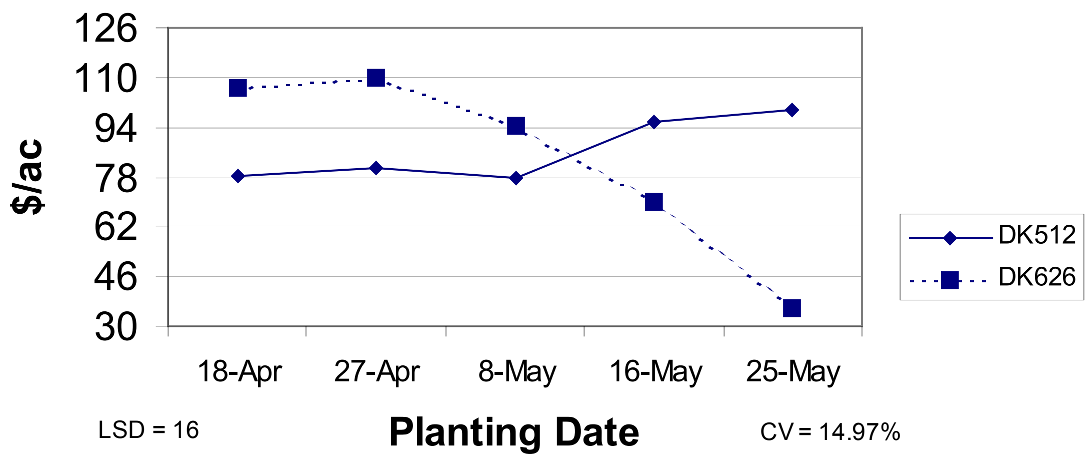

Figure 1. Effect of planting date and relative maturity on corn economic return. Southeast Research Farm; Beresford, SD; 2001.

The long-term yields show that full-season hybrids tested in this study typically out yield their short-season counterparts by at least 10 bu/ac when planted from mid April through early May (Table 6). They both usually have similar yields if planted in mid May, then the short-season hybrid produces nearly 10 bu/ac more grain when planted in late May.

ACKNOWLEDGEMENTS

Grain laboratory analyses for this project were provided by Optimum Quality Grains, L.L.C.; Des Moines, IA.

Table 2. Effect of planting date and relative maturity on corn production.
Southeast Research Farm; Beresford, SD; 2001.

Hybrid (RM)	Planting Date	Plant Population	Grain Yield 1	Moisture Content	Test Weight	Relative Yield
		plants/ac	bu/ac	%	lb/bu	bu/1000 plants
DK 512	**Apr 18**	22,4002	132	13.2	55.4	6.0
(101)	**Apr 27**	24,000	134	13.1	55.1	5.6
	May 08	19,900	131	13.7	54.0	6.7
	May 16	25,500	141	14.3	54.1	5.5
	May 25	25,500	144	15.5	52.9	5.7
DK 626	**Apr 18**	26,900	149	14.8	56.3	5.6
(112)	**Apr 27**	28,000	152	14.9	56.1	5.5
	May 08	24,000	143	16.1	55.2	6.1
	May 16	24,500	136	18.0	54.4	5.5
	May 25	24,800	122	20.7	53.8	4.9
Avg.		24,500	139	15.4	54.7	5.7
LSD $_{(0.10)}$		2,500	10	0.7	0.6	0.7
CV, %		8.33	5.66	3.55	0.90	10.46

1 Grain yield at 15% moisture content and 56 lb/bu test weight.
2 Values are means based on four observations

Table 3. Effect of planting date on corn production regardless of hybrid. Southeast Research Farm; Beresford, SD; 2001.

Planting Date	Plant Populatio n	Grain Yield1	Moisture Content	Test Weight	Relative Yield	Economic Return
	plants/ac	bu/ac	%	lb/bu	bu/1000 plants	$/ac
Apr 18	24,6002	139	14.0	55.8	5.8	92
Apr 27	26,000	141	14.0	55.6	5.5	96
May 08	21,900	138	14.9	54.6	6.4	86
May 16	25,000	140	16.1	54.3	5.5	83
May 25	25,100	137	18.1	53.3	5.3	68
LSD $_{(0.10)}$	2,800	NS3	0.4	0.3	0.5	11

1 Grain yield at 15% moisture content and 56 lb/bu test weight.
2 Values are means based on eight observations
3 NS = Not significant

Table 4. Hybrid effect on corn production regardless of planting date. Southeast Research Farm; Beresford, SD; 2001.

Hybrid	Plant Populatio n	Grain Yield1	Moisture Content	Test Weight	Relative Yield	Net Income
	plants/ac	bu/ac	%	lb/bu	bu/1000 plants	$/ac
DK 512	23,5002	135	13.9	54.3	5.9	86
DK 626	25,600	143	16.9	55.1	5.5	83
LSD $_{(0.10)}$	1,300	NS3	0.3	0.3	0.3	NS

1 Grain yield at 15% moisture content and 56 lb/bu test weight.
2 Values are means based on 20 observations
3 NS = Not significant

Table 5. Grain nutrient composition.1 for date of planting corn study. Southeast Research Farm; Beresford, SD; 2001.

	Oil	Protein	Starch	Lysine	ME 2
	%	%	%	%	kcal/lb
Average	4.1	9.5	71.6	0.309	1774
Maximum	4.4	10.3	72.4	0.323	1802
Minimum	3.9	8.9	70.6	0.300	1753
Range	0.6	1.4	1.8	0.023	49
Std. Dev.	0.2	0.3	0.5	0.005	11
Avg. DM. Yield, lb/ac	380	873	6606	28	16,346 3

1 Dry matter basis (Grain lab DM = 87.9%); 40 observations
2 ME = non-ruminant metabolizable energy
3 ME = Mcal/ac

Table 6. Fourteen-year average yields (1986-2001)1 for date of planting corn study. Southeast Research Farm; Beresford, SD; 2001.

	- - - - - - - - - - Average Planting Date - - - - - - - - - -				
Relative Maturity	April 17	April 27	May 07	May 17	May 27
	---------------------bu/ac @ 15%--------------------				
101-103 day	130	132	131	132	119
112-118 day	143	145	141	131	109

1 No data for 1995 or 2000

SE FARM REPORT
SDSU

DATE OF PLANTING SOYBEAN WITH AND WITHOUT FUNGICIDE SEED TREATMENTS

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Southeast Farm – 0106

SUMMARY

Using seed treatment fungicides did not significantly affect soybean production or profitability in this field during the 2001-growing season. However, in a year when seed quality is poor and early planting is done in cool wet soils, using a seed treatment would be expected to be more profitable.

Important differences among soybean variety and planting date combinations were measured in this trial. Generally speaking, economic return was greatly enhanced wherever significant increases in yield occurred. This was related to the length and growing conditions of the season, the yield potential of the later cultivar, and was maximized by planting it in May.

Symptoms of possible BPMV infection on harvested grain were relatively light, but were uniformly distributed among varieties and all planting dates in this study. Dry matter concentrations and yields of protein averaged 36% and 1100 lb/ac and were 21% and 630 lb/ac for oil. Variety PB2717RR had higher protein levels and variety PB1901RR contained more oil.

INTRODUCTION

Soybean has been shown to respond well in South Dakota to early planting dates. The optimum time to plant varies with environmental conditions and is difficult to predict. Planting early generally exposes soybean to greater disease pressures during germination and emergence. Cool and wet soils can stress the seed predisposing the crop to seedling diseases like Pythium blight, Rhizoctonia root rot, and seedling blight. These diseases can cause stand loss, often in large patches concentrating in lower areas of fields, but they can also reduce crop performance caused by stunting and poor growth. Soybean varieties differ somewhat in their susceptibility to these diseases, but generally speaking all varieties are susceptible. Very little is known about varietal resistance to these diseases, therefore, resistance is not a viable option for managing soybean seedling diseases.

This project has evaluated how soybean varieties respond to planting dates for the past 16 years. This is the third consecutive year that effects of a fungicide seed treatment have been examined as a split planter trial. Bean Pod Mottle Virus symptoms were also monitored again this year.

MATERIALS AND METHODS

Four replications of two Roundup Ready soybean varieties were planted in a 2 X 2 X 5 factorial study at the SDSU SE Research Farm, near Beresford, SD. These varieties represent early and mid to late maturity groups for this area. Five planting dates from early May through mid June were grown in a field with a history of little or no tillage. On every date each variety was planted as six-row plots with 30-inch row spacing. Seed treated with Stiletto (carboxin + metalaxyl) fungicide was placed in three of the planter boxes and the other three contained untreated seed so both types were planted simultaneously (split-planter method). Weeds were controlled with two applications of Roundup (glyphosate) without a residual pre-emergence herbicide or cultivation.

Plant height, stand count, and grain yield were measured from each subplot in the fall and grain was tested for moisture content and test weight. Grain from each untreated subplot was analyzed for protein and oil content and ranked for visual symptoms of possible Bean Pod Mottle Virus (BPMV) infection as either none (0), slight (1), moderate (2), or high (3). Economic return was based on a loan rate of $5.11/bu with grain yield standardized to 13% moisture less variable costs for seed, herbicide, plus a seed treatment cost of approximately $2/ac. Other management information is summarized in Table 1.

Table 1. Management practices for date of planting soybean study. Southeast Research Farm; Beresford, SD; 2001.

Previous Crop	Ridge-till Corn
Tillage System	No-Till
Varieties (Relative Maturity)	Prairie Brand 1901 RR (1.9)
	Prairie Brand 2717 RR (2.7)
Seeding rate, as pure live seed	(1.9) 157,000 seed/ac
	(2.7) 159,000 seed/ac
Herbicide	Roundup, EPP/PRE & Post
Harvest Date	October 11, 2001

RESULTS AND DISCUSSION

Environmental Conditions

Weather and soil conditions were favorable for germination and emergence of soybean seed with abundant to nearly excessive soil moisture earlier in the spring. This field received 2.6 inches of precipitation during the entire time the trial was planted with amounts received ranging from 0.12 to 1.24 inches per planting interval. The crop later experienced moderate to severe moisture stress several times during the dry summer.

Plant populations in this trial were a little low, but still adequate to produce an average or better soybean crop. Bean leaf beetles were common throughout the spring and summer.

Their numbers did not appear high enough to warrant control measures, but they may have influenced crop production either directly or as carriers of Bean Pod Mottle Virus.

Seed Protection

Differences among planting dates and varieties were the primary factors affecting soybean production and economic return this season. Crop responses to fungicide seed treatment were relatively minor and are summarized in Tables 2 through 4 using both treated and untreated seed.

Soybean population averaged 93,500 plants/ac and was relatively consistent between these varieties (Table 2). The late variety (PB2717RR) yielded better, was taller, and more profitable, whereas, the early variety (PB1901RR) had heavier test weight. Population was relatively consistent among planting dates (Table 3). Plants were 2 to 5 inches shorter when planted in early May than at later planting dates. Applying the fungicide seed treatment had no significant effect on any of the responses measured in this study (Table 4). There were no significant interactions between soybean variety and seed treatment. This supports the assertion that there are not major differences in the genetic traits of varieties for resistance to seedling diseases. There were also no significant three-way interactions among variety, planting date, and use of seed treatment. The generally drier environment during planting and early crop growth probably limited seedling disease pressure in this study during 2001.

Untreated Seed

Planting date and variety effects for the long-term aspects of this project are based on our control subplots (untreated seed, Tables 5 through 7 and Figure 1). Plant populations were slightly higher in some cases with the fungicide treatment, and crop responses are nearly identical for untreated and treated seed. Trends noted for seed protection above were consistent among planting dates and varieties for plant population and height, but significant differences were noted for grain yield, moisture content, and test weight (Table 5).

The full-season variety consistently had better yield and was more profitable at a given planting date, except when established in mid June. It also had a wider range of planting dates for optimum yield (early through late May) compared to the shorter season variety (mid May). Grain moisture content was close to 13%, but was wetter for the full-season variety planted during June. Test weight was consistent among planting dates for the early variety (PB1901RR), but was generally lower and fell off dramatically when the full-season variety was planted in mid June. Mid June was actually too late to establish the PB2717RR variety with the growing conditions we experienced this year.

Relatively light symptoms of possible Bean Pod Mottle Virus on grain harvested were uniformly observed in nearly all plots this year (Table 5). Dry matter protein levels averaged 36% and were consistently higher for variety PB2717RR. Oil levels averaged 21% and were consistently higher for variety PB1901RR. Concentration ranges measured for these nutrients were 6.6% for protein and 2.6% for oil (Table 7).

Grain yield results from 2001 did not change the long-term averages reported in Table 6. Early soybean varieties typically produce yields comparable to or slightly better than mid Group II when planted in May. Yields of both groups begin tapering off by early June then dramatically fall by mid June. The full-season variety tested in 2001 performed better than the long-term yields for this group, whereas the short-season variety generally yielded the same as or a little less than its group long-term average.

ACKNOWLEDGEMENTS

Partial support for this project was provided by Mettler Fertilizer; Menno, SD and Gustafson, LLC. Laboratory analyses were conducted by Kevin Kirby; Plant Science Department; South Dakota State University; Brookings, SD.

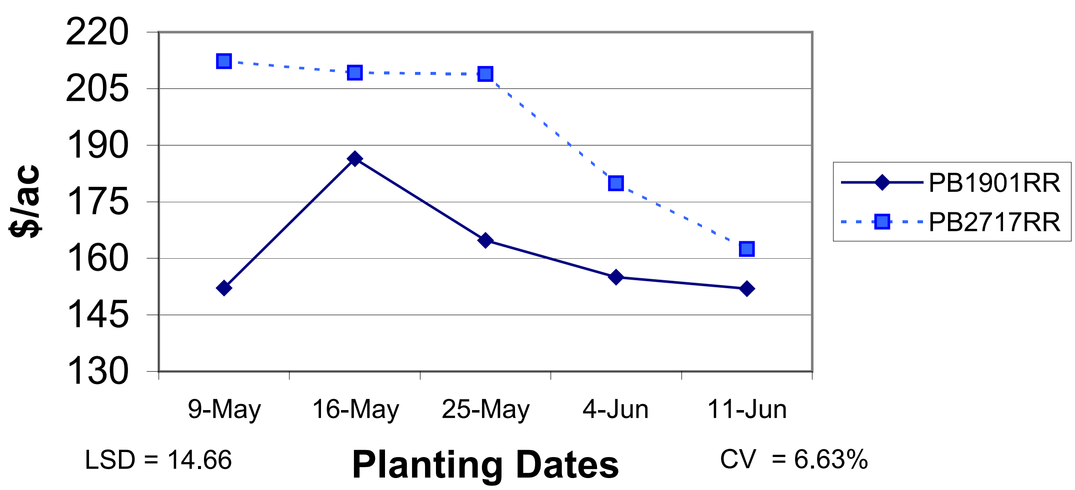

Figure 1. Effect of planting date and variety on soybean net economic return (untreated seed). Southeast Research Farm; Beresford, SD; 2001.

Table 2. Effect of variety on soybean production regardless of planting date or seed protection. Southeast Research Farm; Beresford, SD; 2001.

Variety	Plant Population	Plant Height	Grain Yield [1]	Test Weight	Moisture Content	Economic Return
	plants/ac	inch	bu/ac	lb/bu	%	$/ac
PB1901	94,000 [2]	29.3	41	56.2	12.9	163
PB2717	93,000	35.8	47	54.8	14.2	191
LSD $_{(0.05)}$	NS [3]	0.9	1	0.3	0.2	6

[1] Grain yield at 13% moisture content and 60 lb/bu test weight.
[2] Values are means based on 40 observations
[3] NS = Not significant

Table 3. Effect of planting date on soybean production regardless of variety or seed protection. Southeast Research Farm; Beresford, SD; 2001.

Planting Date	Plant Population	Plant Height	Grain Yield [1]	Test Weight	Moisture Content	Economic Return
	plants/ac	inch	bu/ac	lb/bu	%	$/ac
May 09	90,000 [2]	29.0	44	55.6	13.0	177
May 16	93,000	33.5	47	55.8	13.0	196
May 25	94,000	34.3	46	55.9	13.0	187
Jun 04	93,000	33.5	42	55.7	13.3	170
Jun 11	96,000	32.5	40	54.3	15.5	156
LSD $_{(0.05)}$	NS [3]	1.4	2	0.4	0.4	9

[1] Grain yield at 13% moisture content and 60 lb/bu test weight.
[2] Values are means based on 16 observations
[3] NS = Not significant

Table 4. Performance of treated vs. untreated seed on soybean production regardless of planting date or variety. Southeast Research Farm; Beresford, SD; 2001.

Seed Protection	Plant Population	Plant Height	Grain Yield [1]	Test Weight	Moisture Content	Economic Return
	plants/ac	inch	bu/ac	lb/bu	%	$/ac
Untreated	91,000 [2]	30.3	44	55.2	13.5	178
Treated	96,000	30.3	45	55.2	13.6	176
LSD $_{(0.05)}$	NS [3]	NS	NS	NS	NS	NS

[1] Grain yield at 13% moisture content and 60 lb/bu test weight.
[2] Values are means based on 40 observations
[3] NS = Not significant

Table 5. Interaction of planting date and variety on soybean production without seed treatment. Southeast Research Farm; Beresford, SD; 2001.

Variety	Planting Date	Plant Population	Plant Height	Grain Yield[1]	Moisture Content	Test Weight	BPMV Score [2]
		plants/ac	inch	bu/ac	%	lb/bu	
PB1901	**May 09**	80,000 [3]	26.9	39	13.2	55.8	1.0
	May 16	91,000	29.6	45	13.0	56.2	1.1
	May 25	94,000	30.3	41	12.9	56.0	1.0
	Jun 04	101,000	30.9	39	12.6	56.4	1.0
	Jun 11	92,000	29.5	39	13.0	56.4	1.0
PB2717	**May 09**	90,000	32.6	51	12.8	55.2	1.0
	May 16	81,000	38.5	50	13.0	55.3	0.8
	May 25	89,000	37.6	50	13.1	55.7	1.0
	Jun 04	97,000	37.0	44	13.9	55.3	0.5
	Jun 11	91,000	35.3	41	17.9	52.4	1.0
Avg.		91,000	32.8	44	13.5	55.4	0.9
LSD $_{(0.10)}$		NS [4]	NS	3	0.6	0.6	NS
CV, %		13.40	6.27	5.28	3.72	0.89	31.93

[1] Grain yield at 13% moisture content and 60 lb/bu test weight.
[2] BPMV = Bean Pod Mottle Virus
[3] Values are means based on four observations
[4] NS = Not Significant

Table 6. Sixteen-year average yields (1986-2001) for date of planting soybean study. Southeast Research Farm; Beresford, SD; 2001.

	- - - - - - - - - - Average Planting Date - - - - - - - - - -				
Variety	May 5	May 15	May 25	June 4	June 14
	--------------------bu/ac @ 13%-------------------				
Early (Group I & II)	45 *	43	43	41	35
Mid (Group II)	44 *	43	42	39	35

*15-yr avg. (1986-2001); too wet to establish early May planting date in 1999

Table 7. Grain nutrient composition[1] for date of planting soybean study. Southeast Research Farm; Beresford, SD; 2001.

	DM Oil	**DM Protein**
	%	%
Average	20.7	35.9
Maximum	21.9	39.2
Minimum	19.4	32.6
Range	2.5	6.6
Std. Dev.	0.6	1.6
Avg. DM Yield, lb/ac	633	1,107

[1] Dry matter (DM) basis (lab DM = 92%) based on 40 observations

SE FARM REPORT
SDSU

CORN ROW SPACING & POPULATION STUDY

R. Berg, D. DuBois, R. Stevens,
and G. Williamson

Southeast Farm 0107

SUMMARY

Conditions were generally favorable this year in terms of abundant spring soil moisture and the total amount of precipitation received during the growing season. However, the crop was moderately to severely moisture stressed during most of June and July. When the hybrid tested was grown at 20,000 to 30,000 plants/ac, the amount of grain produced per acre was nearly identical regardless of the population. The economic penalty for planting a higher seeding rate under these conditions was about $15/ac. The efficiency of grain produced per plant increased as plant population decreased with an average range of 0.27 to 0.41 lb of dry matter grain per plant. Subtle but minor population effects were also detected for grain quality traits like field moisture and protein and lysine contents. Row width, however, had little or no impact on corn production and there were no significant interactions between plant populations and row widths for any of the responses measured in this study. Moisture stresses the crop experienced during the middle part of the growing season seemed to cause the low population to perform better and the high population to perform worse than normal.

INTRODUCTION

Management factors that affect plant distribution throughout a field influence crop production. A large part of this is due to competition involving many interactions among plants for available resources like sunlight, water, and nutrients. The type and number of plants that survive, their growth rates, and how they are distributed in time and space play important roles. The goal in successful cropping systems is to optimize as many of these factors as possible, including harvesting and marketing its production.

Planting corn in relatively narrow rows with uniformly spaced plants at fairly high populations is often encouraged to enhance productivity in the Midwest. Some producers in the western Cornbelt plant corn at low to moderate seeding rates and in wide row widths to help reduce risks from dry weather and barren stalks. Long-term information about these factors helps farmers decide how much seed to plant and whether changing their equipment lineup by either modifying what they already own or purchasing new or used equipment is justified.

The optimum combination is usually a population of 25,000 plants/ac and a row width of 30 inches, especially during average growing conditions. Theoretically lower plant densities (low populations and/or wide row widths) should have an advantage when moisture is limiting and higher plant densities (high populations and/or narrow row widths) when moisture is abundant. The long-term results of this research indicate that a medium plant density (25,000 plants/ac and 30 inch row spacing) is difficult to beat in any given year.

METHODS

This study is designed to evaluate several stand densities planted at various row widths to measure their influence on the production, quality, and profitability of dryland corn in the western Cornbelt. Similar research has been conducted annually at our station since 1992.

This year one corn hybrid was planted in 20-, 30-, and 36-inch row widths at a seeding rate of more than 30,000 seeds/acre. Seedlings were hand thinned shortly after emergence (V4 stage) to obtain plant populations of 20,000, 25,000 and 30,000 plants/ac. Nine treatments were established as a completely randomized block design with four replications of each combination. This field was conventionally tilled and managed as a corn-soybean rotation.

Stand count, grain yield, moisture content, and test weight were measured at harvest. Relative yield was calculated as the ratio between grain harvested and the actual plant population for each plot. Net economic return is based on the fresh weight yield for corn marketed during harvest at $1.73/bu after subtracting variable costs for seed, fertilizer, herbicide, and moisture dockage (at $0.05/bu per point of grain moisture greater than 15%). Grain samples from each plot were analyzed by near infrared (NIR) spectroscopy. Oil, protein, and starch concentrations and calculated lysine and non-ruminant metabolizable energy (ME) values are reported on a dry-matter basis. Other management factors are outlined in Table 1.

RESULTS AND DISCUSSION

Soil moisture was abundant this spring, but the crop was moderately to severely stressed for moisture several times during the growing season. Good rainfall in late July provided enough moisture for an average yield. Weed control was only rated as fair this year and probably also reduced grain yield a little. The crop dried down well in the fall and had good test weight.

Table 1. Management practices for corn row spacing and population study. Southeast Research Farm; Beresford, SD; 2001.

Previous Crop	Soybean
Tillage System	Conventional
Hybrid	Pioneer 34K77
Fertilizer; N-P_20_5-K_20, lb/ac (source)	178-0-0 (as 28-0-0), PPI
Herbicide	Eradicane + Bladex, PPI
Date Planted	May 8, 2001
Date Thinned	June 13, 2001
Date Harvested	October 15, 2001

Plant populations had the greatest impact on corn production this season, especially on relative yield and net economic return (Table 2). Low populations produced a lot more grain per plant (0.41 lb/plant) than either the intermediate (0.34 lb/plant), or high (0.27 lb/plant) populations. Less within-crop competition allowed larger ears on individual plants in the lower populations, however, additional ears associated with more plants yielded similar amounts of grain per acre.

The next question becomes whether the cost of buying additional seed to plant higher populations is worth it. This year profitability was similar between the low and intermediate plant populations, but was about \$15/ac less for the higher population.

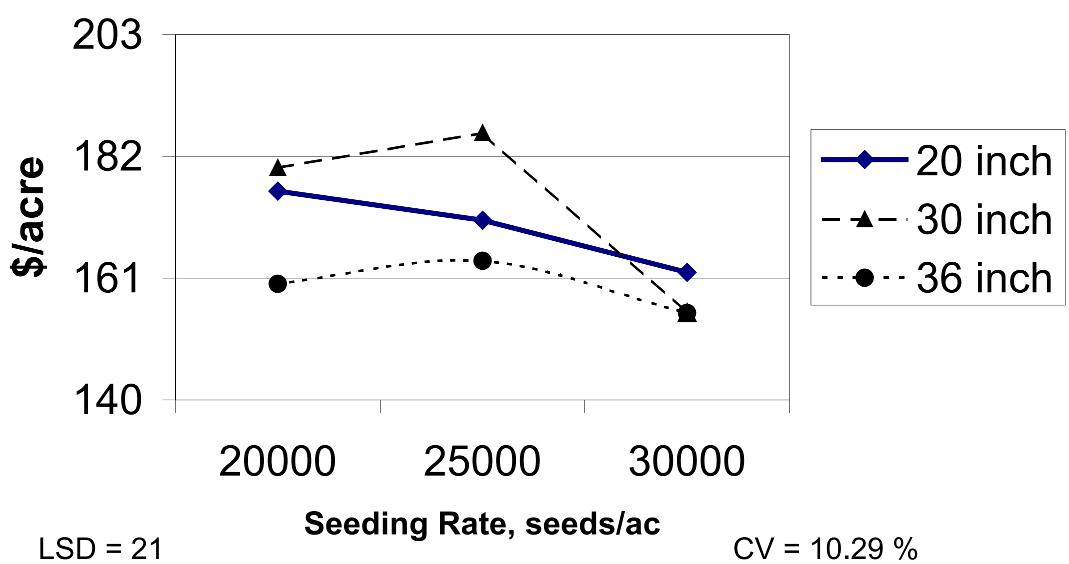

Figure 1. Row spacing and seeding rate effects on economic return for corn. Southeast Research Farm; Beresford, SD; 2000

Several subtle differences in grain quality between corn seeding rates were also detected. Grain from the higher seeding rate was about 0.5% drier at harvest, which translates to a little less moisture dockage. Grain from the lower seeding rate had a little higher protein (0.14%) and lysine (0.002%) concentrations.

Row width had little or no effect on the production, quality, or profitability of this hybrid and no significant interactions were observed between row spacing and seeding rate (Tables 3 and 4).

Summary statistics for several grain nutrients are presented in Table 5. Grain quality was not dramatically influenced by row width or seeding rate except as noted above. Average dry matter grain nutrient concentrations and yields were 3.9% and 389 lb/ac for oil, 9.6% and 955 lb/ac for protein, 72% and 3.6 ton/ac for starch, 0.31% and 31 lb/ac for lysine, and 1,768 kcal/lb and 17,600 Mcal/ac for non-ruminant metabolizable energy.

ACKNOWLEDGEMENTS

Grain laboratory analyses for this project were provided by Optimum Quality Grains, L.L.C.; Des Moines, IA.

Table 2. Seeding rate effect on corn production regardless of row spacing. Southeast Research Farm; Beresford, SD; 2001.

Seeding Rate [1]	**Grain Yield** [2]	**Grain Moisture**	**Test Weight**	**Relative Yield**	**Net Economic Return**
PLS/ac	bu/ac	%	lb/bu	bu/1000 plants	$/ac
20,000	146[3]	16.3	57.6	7.3	172
25,000	151	16.2	57.9	6.0	174
30,000	145	15.8	57.9	4.8	157
LSD $_{(0.10)}$	NS	0.3	NS	0.3	12

[1] Pure Live seed basis
[2] Grain yield at 15% moisture and 56 lb/bu test weight
[3] Mean values each based on 12 observations

Table 3. Row spacing effect on corn production regardless of seeding rate.
Southeast Research Farm; Beresford, SD; 2001.

Row Spacing	Grain Yield [1]	Grain Moisture	Test Weight	Relative Yield	Net Economic Return
Inch	bu/ac	%	lb/bu	bu/1000 plants	$/ac
20	149[2]	16.2	57.8	6.1	169
30	150	16.0	58.0	6.2	174
36	143	16.1	57.6	5.9	160
LSD $_{(0.10)}$	NS	NS	NS	NS	NS

[1] Grain yield at 15% moisture and 56 lb/bu test weight.
[2] Mean values each based on 12 observations

Table 4. Row spacing and seeding rate effects on corn production.
Southeast Research Farm; Beresford, SD; 2001.

Row Spacing	Seeding Rate [1]	Grain Yield [2]	Grain Moisture	Test Weight	Relative Yield	Net Economic Return
Inch	**PLS/ac**	bu/ac	%	lb/bu	bu/1000 plants	$/ac
20	**20,000**	150[3]	16.6	57.6	7.5	176
	25,000	151	16.3	57.8	6.0	171
	30,000	148	15.7	58.1	4.9	162
30	**20,000**	151	16.1	58.0	7.5	180
	25,000	156	16.1	58.0	6.2	186
	30,000	143	15.6	58.0	4.8	155
36	**20,000**	139	16.1	57.4	7.0	160
	25,000	146	16.0	58.0	5.8	164
	30,000	146	16.1	57.5	4.8	155
Avg.		147	16.1	57.8	6.1	168
LSD $_{(0.10)}$		11.6	0.54	0.64	0.44	NS
CV, %		6.49	2.76	0.92	6.00	10.29

[1] Pure live seed basis
[2] Grain yield at 15% moisture and 56 lb/bu test weight.
[3] Mean values each based on 4 observations

Table 5. Corn grain nutrient composition[1] for row spacing and plant population study. Southeast Research Farm; Beresford, SD; 2001.

	Oil	Protein	Starch	Lysine	ME [2]
	%	%	%	%	kcal/lb
Average	3.9	9.6	72.3	0.310	1768
Maximum	4.2	9.9	73.2	0.308	1777
Minimum	3.6	9.3	71.7	0.307	1758
Range	0.6	0.6	1.5	0.001	19
Std. Dev.	0.1	0.2	0.3	0.002	4
Dry Matter Yield, lb/ac	389	955	7195	31	17,600[3]

[1] Dry matter basis (Grain lab DM = 88%); 36 observations
[2] ME = metabolizable energy
[3] Mcal/ac

PHOSPHORUS RATE AND PLACEMENT EFFECTS ON TILLED CORN AND SOYBEAN ROTATION.

R. Gelderman, J. Gerwing, R. Berg, and A. Bly

Plant Science 0108

INTRODUCTION

Phosphorus (P) fertilizer placement questions are still a concern. Is row placement of P more effective than broadcast for corn and soybean under a tilled environment? Will fertilizing only the corn in the rotation influence soil tests and influence yields on the following soybeans? Because of these questions, a long-term experiment was established south of the office building at the Southeast Experiment Farm. Objectives are to determine the long-term effect of P management practices on yield and soil test level in a tilled corn-soybean rotation.

METHODS

Egan silty clay loam is the predominant soil of the study location. The study is separated into two parts by another experiment (210' apart). The west side has soybean in odd years and the east side has corn in odd years. Each side is a corn-soybean rotation. The west side is smaller in area and only four treatments could be established compared to six on the east side. The treatment numbers 1,2,4 and 5 on the east side are identical to treatment numbers 7,8,9 and 10 on the west side. Treatments and locations are given in Table 1.

The row treatments for corn utilize 10-34-0 placed directly with the seed. The 30 lb/ac P_2O_5 rate of this material will supply 9 lb of N/ac. Broadcast placements received 11-52-0 as a P source. Nitrogen was not balanced for these treatments. Broadcast treatments were applied and disk incorporated prior to planting. Starter treatments for soybeans (west side) have only residual treatments from the 2000 corn.

The east side was planted to Dekalb DK580RR corn on May 9 at 26,900 seeds/ac. Sidedress nitrogen was applied as liquid 28% at a rate of 135 lb N/ac. Weed control consisted of 26 oz/ac of Roundup on June 19. Plot size is 15 x 50'. Corn grain yield was estimated by harvesting three of the center rows with a field combine on October 15.

Prairie Brand 1901RR soybeans were planted on the west side on May 16 at 178,000 seeds/ac in 30-inch rows. Weed control was 2 pt/ac of Dual applied on May 18 and 26 oz/ac of Roundup applied June 19. Plot size is 15' X 50' with 30-inch rows. Soybeans were harvested on September 26.

RESULTS AND DISCUSSION

Phosphorus treatment significantly influenced corn yield in 2001 (Table 1). However, a broadcast application (tilled in) of 30 lb/ac of P_2O_5 was statistically similar to the check. In general, row applications of P or broadcasting at least 60 lb/ac of P produced similar yields.

The residual P treatments from the 2000 corn did not influence soybean yields (Table 1).

Soil P analysis is increasing with the 60 lb/ac P_2O_5 treatments (Table 2). This would be expected as P_2O_5 removal with the grain is about 30 – 35 lb/ac (Table 2).

Table 1. Yields for P placement and rate study, Southeast Research Farm, Beresford, SD; 2001.

Treatment number	2001 crop	Side of experiment	P_2O_5 rate	P placement	Crop P is Applied to[1]	Yield
			lb/ac			Bu/ac
1	corn	East	0	--	--	129
2	corn	East	30	Row	c	144
3	corn	East	30	Row	c+s	132
4	corn	East	30	Bct[2]	c	121
5	corn	East	60	Bct	c	136
6	corn	East	30 30	Bct Row	c+s	142
7	soybean	West	0	--	--	39
8	soybean	West	30	Row	c	42
9	soybean	West	30	Bct	c	37
10	soybean	West	60	bct	c	39

[1]c=corn, s=soybean.

[2]bct=broadcast

Yield statistics: Pr>F:corn all treatments=0.05, CV=7.3. $LSD_{.05}$ = 15 bu.

soybean all treatments=0.19(NS), CV=6.9.

Table 2. Soil tests and grain nutrient removal from P placement study, Southeast Research Farm, Beresford, SD; 2001.

Treatment number	Soil test[1] P 1998-soy	1999-corn	2000-soy	2001-corn	P_2O_5 removed in grain 1998-soy	1999-corn	2000-soy
	ppm				lb/ac		
1	--	5	5	6	27	27	26
2	--	5	5	9	30	31	27
3	--	5	9	8	35	31	29
4	--	6	5	8	34	28	25
5	--	15	11	16	35	30	27
6	--	13	10	15	37	31	29
	Corn	Soybean	Corn	Soybean	Corn	Soybean	Corn
7	4	7	5	6	47	20	19
8	--	6	6	9	57	21	21
9	4	7	6	7	55	20	20
10	6	8	11	12	58	22	21

[1]Sampled 0-6 inches on 11/4/98, 3/29/00,10/10/00, and 10/18/01.

The 2001 plant nutrient analysis is not yet complete.

NITROGEN APPLICATION TIMING INFLUENCE ON CORN GRAIN YIELD AND RESIDUAL SOIL NITRATE-N, BERESFORD, 2001

J. Gerwing, R. Gelderman, A. Bly, and B. Berg

Plant Science 0109

INTRODUCTION

Many opportunities for application of nitrogen occur during the year. It can be applied from the fall after soybean harvest until side-dress when corn has six leaves. During this time, conditions for N leaching and/or denitrification can occur. These losses reduce N availability to corn and may reduce yield potential. A research project was initiated to measure the affect of N application timing on N availability to corn in a corn-soybean rotation.

MATERIALS AND METHODS

A site was selected on the Southeast Research Farm near Beresford SD. Five application timings and a 0 N check were included in a randomized complete block plot design with four replications. The N applications were applied: 1) soon after soybean harvest (EF=early fall), 2) after soil temps cooled below 50 degrees F (LF=late fall), 3) during March or April (ES-early spring), 4) immediately before planting (LS-late spring), or 5) when the corn was at the fifth leaf stage (SD=side-dress). Application dates for each timing treatment can be found in Table 1. All plots were tilled after the EF and LS applications to prevent volatilization losses of the broadcast urea. Urea was used for all treatments except the side dress. Ammonium nitrate was used in the sidedress treatment to prevent volatilization losses since plots were not cultivated. The late fall and early spring urea applications were not incorporated. It was assumed that cool conditions during these application times would result in minimal volatilization losses of N.

The nitrogen rate for all timings was 140 pounds per acre. The previous crop was soybean. Roundup ready corn was planted on May 9. Plots were harvested with a field plot combine. Soil samples were taken to a depth of 36 inches on July 17 and to a depth of 18 inches on October 18, 2001. Replications were combined and analyzed for nitrate.

RESULTS AND DISCUSSION

Corn grain yields were 144 bu/ac in the 0 N check and averaged 165 bu/ac in the nitrogen timing treatment (Table 1). There was a significant increase in yield (21 bushels) to the application of nitrogen but no difference in yield due to nitrogen timing. Soil samples taken on July 17 indicated more nitrogen was available in the top three feet of soil with the later nitrogen applications (Table 2) but these differences did not result in yield differences. The lack of difference in yield was likely due to adequate nitrogen remaining in the profile for maximum yield with the earliest (fall) application and therefore additional available N in the later applications would not increase yield.

The increase in available N in the profile with later applications indicates some of the earlier applied N was lost to leaching or denitrification. Almost 6 inches of rain in October and November (Table 3) after the fall application and heavy rain in April and May (8.3 inches) likely caused some losses of nitrogen. Soil samples taken on October 18 show a steady increase in residual N with the later N application timings (Table 4). The lowest residual N was in the fall application (79 lb/ac) and the highest in the sidedress (222 lb/ac), indicating less loss of N with N application closer to the time of crop uptake.

Table 1. N application Timing Effect on Corn Grain Yield at the Southeast Research Farm, Beresford, SD in 2001.

N Application Timing	Date	Nitrogen Rate & Timing	Nitrogen Timing
		----------------------- bu/ac	-----------------------------
Check	None	144 a[1]	----
Early Fall (EF)	10-10-00	166 b	166 a
Late Fall (LF)	4-16-01[2]	167 b	167 a
Early Spring (ES)	4-16-01	168 b	168 a
Late Spring (LS)	5-9-01	158 b	158 a
Side-dress (SD)	6-20-01	167 b	167 a
Pr>F		.007	0.44
CV %		5.2	5.1
LSD (.05)		12.7	NS

[1] means with similar lower case letter are not significantly differently within a comparison column

[2] applied in spring due to early fall snow

Table 2. July Soil Nitrate Levels from Nitrogen Timing Study; Beresford, 2001.

Sample	N Application[1] Date			
Depth	None	October 10, 2001	April 16, 2001	May 9, 2001
Inches		----------------------lb NO_3-N[2]	-----------------------	
0-6	34	84	116	167
6-12	7	19	21	17
12-24	28	51	35	37
24-36	19	34	25	34
Total	88	188	197	255

[1] 140 lb N

[2] sampled July 17, 2001

Table 3. Rainfall at the Southeast Research Farm, Beresford, Nov. 1, 2000 to Oct. 31, 2001.

Nov[1]	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
-------	-------	-------	-------	-------	-------	inches	-------	-------	-------	-------	-------
3.1	0.3	1.4	0.5	0.4	5.2	3.1	1.5	4.5	1.2	3.2	0.9

[1] 2.7 inches rain between 10/10/2000 N application and 11/1/00

Table 4. October Soil Nitrate Levels from Nitrogen Timing Study; Southeast Research Farm, Beresford, 2001.

Sample[1] Depth	N Application[1] Date				
	None	Oct 10, 2000	April 16, 2001	May 9, 2001	June 20, 2001
Inches	-------	-------	lb NO_3-N[2]	-------	-------
0-6	14	53	65	106	141
6-12	6	16	27	34	16
12-18	3	10	7	10	65
Total	23	79	99	150	222

[1] 140 lb N

[2] sampled October 18, 2001

LONG-TERM RESIDUAL PHOSPHORUS STUDY

Ron Gelderman and Jim Gerwing

Plant Science 0110

INTRODUCTION

This study was established in 1994 on a phosphorus (P) study site that began in 1964. The low soil test P treatment of this experiment has not received fertilizer P for over 30 years.

The objectives of this study are:

1. To determine optimum P soil test level under residual P management and under management where P is added each year.

2. To determine maintenance levels of P as affected by initial P soil test levels.

3. To compare the influence of annual P placements (broadcast vs. band) upon crop yields.

METHODS

Four soil test levels (Table 1) were established by broadcasting phosphorus fertilizer (10-34-0) in the spring of 1993 and were incorporated with a chisel plow. Four replications with soil test P level as main blocks and annual P application rates as the split block were established. Two medium (M) soil test levels were established to compare placement (broadcast and band) effects for annually applied P rates. Soybeans were planted in 1993. The stubble was moldboard plowed in the fall to further incorporate the applied P.

In 1994 the annual P rates for the medium broadcast block were incorporated before planting. Since that time they have been broadcast on the surface after planting. In 1994 five lb/ac of zinc (as zinc sulfate) was applied on all plots. A no-till corn and soybean rotation has been established since 1995. In 1997 soybeans were drilled in 7.5-inch rows and the P row treatments were applied with the seed. Previously, soybeans had been planted on 30-inch rows with the banded P applied 2 x 2.

Prairie Brand 1901RR soybeans were planted May 16, 2001 with a 10 ft. JD 750 no-till drill (7.5” row spacing at 200,000 seeds/ac). Annual band P treatments (0,20,40,60 lb P_2O_5/ac) were applied with the seed. Broadcast P rates were hand applied on the soil surface after planting. Phosphorus applied was 0-46-0. Plot size was 10’ x 45’. The five-foot fill area between plots was seeded with a no-till plot planter on 30-inch rows. Weed control consisted of 1.3 pt/ac Broadstrike Dual + 0.9 pt Dual II + 1.6 pt/ac Roundup applied on May 25 as a preplant/burndown application, and 3 pt/ac Roundup applied on July 12. The entire plot area was harvested with a field combine on September 27.

Because of extremely dry soil conditions, soil samples were not taken in the fall of 2000. These samples were taken in March of 2001, and these results are reported in the tables.

RESULTS AND DISCUSSION

Phosphorus soil tests have stayed almost constant since the fall of 1994 on soil test levels 1 and 2. However, for the two high soil test levels, P tests have fallen since 1994 (Table 1). This decrease is because of grain removal of P with no additions of P. Grain P removal increased as soil test increased. This is because of slightly higher grain yields and significantly higher grain P concentrations.

Phosphorus soil tests appear to be increasing with annual broadcast applications above 20 lb/ac (Table 2). Grain removal has averaged about 39 lb P_2O_5/ac per year when P is applied. At the lowest rate of P application (20 lb P_2O_5/ac), only 50% of the P removed is returned to the soil as fertilizer. Yet, the soil test is fairly stable (6-8 ppm). The plant may be translocating deeper soil P to the soil surface or more of the P may be in the form that is measured with the soil tests.

Rate of phosphorus significantly increased soybean yields in 2001 (Table 3). The 20 lb P_2O_5/ac rate produced an average of 3 bu/ac over check. Additional P did not increase yields further. Soil test did not significantly influence soybean yield. There is a 6 bu increase due to soil test where no annual P has been added (0 rate) but no influence of soil test on yield where annual P was applied.

There was an increase of about 5-6 bu/ac with added P with either placement method. Therefore it made no difference if the P was applied with the seed or broadcast on the surface. This has been consistent with most years of the study.

Table 1. Phosphorus soil tests[1] and grain P removal from soil test treatments (no annual P) of the long-term P study, Southeast Farm, Beresford, SD. (Project no. 0601).

Soil Test Level	-------------------- Olsen P soil test ------------------------							P_2O_5 removal by grain (7 yr.)	
	1994	1995	1996	1997	1998	1999	2000	Total	Ave.
	--------------------------- ppm -------------------------							-- lb/ac --	
1	3	3	3	3	3	3	2	172	25
2	5	4	4	3	4	3	3	211	30
3	8	7	8	7	6	6	6	243	35
4	15	13	14	10	11	8	7	271	39

[1] Sampled (0-6") in the fall of each year from zero rate of each soil test level except for 1999 and 2000 which were sampled in the spring of following year.

Table 2. Phosphorus soil tests[1] and grain P removal from broadcast rates of the long-term P study, Southeast Farm, Beresford SD. (Project no. 0601)

P_2O_5 rate	-------------------- Olsen P soil test -------------------------							P_2O_5 removal by grain (7 yr.)	
	1994	1995	1996	1997	1998	1999	2000	Total	Ave.
lb/ac	--------------------------- ppm --------------------------							-- lb/ac --	
0	6	5	5	4	4	3	4	243	35
20	6	8	9	8	7	6	9	274	39
40	7	8	12	11	13	12	11	276	39
60	8	12	16	16	18	16	19	276	39

[1] Sampled (0-6") in fall of every year from each annual rate of the broadcast treatment except in 1999 and 2000 which were sampled in the spring of the following year.

Table 3. Soybean yield as influenced by P soil test, annual P application rate and placement from the long-term P study during 2001 at Southeast Farm, Beresford SD. (Project no. 0601)

Soil test category[1]	---------------- annual P_2O_5 rates - lb/ac ------------------- 0	20	40	60	Ave.
	------------------------------ Yield, bu/ac ---------------------------------				
1 (band)	35	42	41	39	39
2 (band)	35	40	42	39	39
2 (bct.)	35	41	42	40	40
3 (band)	37	40	40	39	39
4 (band)	41	39	40	41	40
Ave.	37	40	40	40	--

[1] 1,2,3,4,and 5 (Olsen P,spring 2001)= 2 ppm (very low), 3 ppm(very low), 4 ppm(low), 6 ppm (low), and 7 ppm (low), respectively.
Pr >F: all treatments but broadcast: Soil test level = 0.70(NS); annual rate = 0.05; soil test x rate = 0.62(NS). C.V.=10.6.
Pr>F: Treatments 2 and 3: Placement = 0.49(NS); annual rate = 0.14 (NS); placement x rate = 0.49(NS). C.V.= 11.8%

SE FARM REPORT
SDSU

FERTILIZER POTASSIUM, SULFUR, ZINC, PHOSPHORUS, BORON AND LIME EFFECTS ON SOYBEAN YIELD ON HIGH TESTING SOIL

J. Gerwing, R. Gelderman, R. Berg and A. Bly

Plant Science 0111

INTRODUCTION

Some farmers in South Dakota are using phosphorus, potassium, sulfur, zinc, or lime on soils with high soil tests. Research by soil fertility staff at South Dakota State University during the last 30 years has not shown consistent economical responses to these fertilizer nutrients or lime when soil test levels are high. Therefore, the SDSU Soil Testing Lab does not recommend fertilizer nutrient application unless soil test levels are lower. The studies reported here were established in 1988 and 1990 to determine the effects of each of these commonly used nutrients and lime on corn and soybean yields and soil test levels when applied to high testing soils.

MATERIALS AND METHODS

Two experimental sites were established, one on the Southeast Research Farm near Beresford in 1988 and another on the Agronomy Farm near the SDSU campus in Brookings in 1990. Fertilizer treatments have continued at each location on the same plots since establishment. A corn-soybean rotation was followed at both locations. Soybean was the 2001 crop.

The soil at the Southeast Farm site is an Egan silty clay loam. Egan soils are well drained soils formed in silty drift over glacial till. The soil at the Brookings Agronomy Farm is classified as a Vienna loam. Vienna soils are well drained medium textured loam and clay loam soils formed from glacial till. Both soils are typical upland soils for their respective areas in the state.

Fertilizer treatments were 50 lbs K_2O, 25 lbs sulfur (as elemental sulfur), 5 lbs zinc (as zinc sulfate) and lime at both locations (Table 1). In addition, the Brookings site had a 40 lb P_2O_5 treatment and the Beresford site a boron treatment (2 lb/ac). The fertilizer treatments were applied each spring since the establishment year (1988 at Beresford and 1990 at Brookings) on the same plots. An exception is the boron treatment at Beresford, which was initiated in 1997. Lime was applied only once (the establishment year) at the SE Farm location and twice (1990 & 1992) at Brookings. All fertilizer materials were broadcast and followed by either discing or field cultivation. Herbicides were applied as needed at both locations. A randomized complete block design with four replications was used at both sites. Plot size was 15 by 65 feet at Beresford and 20 by 40 feet at Brookings.

Soybeans were planted May 16 at Beresford and May 30 at Brookings. Harvest was done with a field combine at Beresford and a plot combine at Brookings.

RESULTS AND DISCUSSION

Soil test results from soil samples taken before 2001 fertilizer applications are presented in Table 2. Potassium soil tests were very high at both sites although just into the very high range (>160 ppm) at

Brookings. Adding 50 lb of K_2O per year since 1988 at Beresford and 1990 at Brookings raised the K soil test by 205 and 49 ppm respectively.

The sulfur soil test in the check plots was medium at Beresford and very low at Brookings. Adding 25 lb sulfur each year had little residual effect, raising soil test only 4 lb per acre at Beresford and 8 lb per acre at Brookings.

The zinc soil test in the check was medium at Beresford (0.61 ppm) and very high at Brookings (1.02). Applying 5 lb zinc each year raised the soil test to 6.60 and 9.40 ppm at Beresford and Brookings respectively.

The lime treatments made at the beginning of this study still had residual effect on pH this year. The check pH at Beresford was 5.3 and limed pH 5.9. At Brookings the check pH was 6.4 and limed pH 6.7.

The phosphorus soil test level at the Brookings site was 22 ppm without the phosphorus applications and no phosphorus would have been recommended. The 40 lb annual phosphorus application raised the Olson soil test level to 34 ppm. There was no phosphorus treatment at Beresford.

The 2 lb boron treatment started at Beresford in 1997 raised the boron soil test from 0.89 ppm to 3.02 ppm. The check soil test was in the high range (>0.50 ppm) and no boron would have been recommended.

Soybean yields for the Beresford location ranged from 39 to 42 bushels per acre (Table 3) and were not significantly affected by any of the fertilizer treatments. Even though the sulfur and zinc soil tests were in the medium range, adding these nutrients did not increase yield. Mineralization of organic sulfur and/or sulfur obtained from deeper in the profile was adequate for soybean growth. Soybeans normally do not respond to zinc fertilizer additions.

Soybean yields at the Brookings site ranged from 28 to 31 bushel per acre (Table 4) and were not influenced by fertilizer treatments. The sulfur soil test was low, but similar to the Beresford site and likely for the same reasons, fertilizer sulfur did not increase yield. The potassium, zinc, phosphorous and pH soil test were all in a range where no addition would have been recommended and no response was expected.

Yield results and soil test levels from previous years for these two studies can be found in the Southeast Farm Progress Reports (1988-2000) and in the 1988-2000 SDSU Plant Science Department Soil/Water Science Research annual report, Technical Bulletin Nos. 97 or 99.

Table 1. Fertilizer Treatments, Fertilizer and Lime Demonstration; Beresford and Brookings, 2001.

Treatment	Fertilizer Rates Beresford[1]	Brookings[2]
	- - - - - - - - lb/ac - - - - - - - -	
Check	0	0
Phosphorus (P_2O_5)	-----[3]	40
Potassium (K_2O)	50	50
Sulfur	25	25
Zinc	5	5
Boron	2	-----[3]
Lime	-----[4]	-----[5]

[1] Applied each spring, 1988-2001 except boron applied only since 1997.
[2] Applied each spring, 1990-2001.
[3] Not a treatment at this location.
[4] 4000 lb $CaCO_3$ equivalent applied spring 1988.
[5] 2500 and 2400 lb $CaCO_3$ equivalent applied spring 1990 and 1992 respectively.

Table 2. Soil Test Levels, Fertilizer and Lime Demonstration; Beresford and Brookings.

	Soil Test Level			
	Beresford[1]		Brookings[2]	
Soil Test	Check	Treatment	Check	Treatment
Potassium ppm	207	412	171	220
Sulfur, lb/A, 0 - 6 in	6	16	2	4
lb/A, 6 - 24 in	24	18	6	12
Zinc, ppm	0.61	6.60	1.02	9.40
pH	5.3	5.9	6.4	6.7
Olson Phosphorus, ppm	5	-----	22	34
Boron	0.89	3.02	-----	-----
NO_3-N, lb/A 2 ft	93	-----	16	-----
Organic Matter, %	3.1	-----	3.2	-----
Salts, mmho/cm	0.4	-----	0.3	-----

[1] Sampled 10/30/00
[2] Sampled 4/27/01

Table 3. Fertilizer Effects on Soybean Yield; Beresford, 2001.

Fertilizer Treatment	Yield
	bu/ac
Check	40
Potassium	40
Sulfur	39
Zinc	42
Boron	40
Lime	41
Prob of > F	0.65
C.V. %	7.0
LSD .05	NS

Table 4. Fertilizer Effects on Soybean Yield; Brookings, 2001.

Fertilizer Treatment	Yield
	bu/ac
Check	31
Phosphorus	28
Potassium	31
Sulfur	31
Zinc	30
Lime	30
Prob of > F	0.56
C.V. %	7.7
LSD .05	NS

NITROGEN MANAGEMENT IN A CORN-SOYBEAN ROTATION

J. Gerwing, R. Gelderman, A. Bly, and B. Berg

Plant Science 0112

INTRODUCTION

There is increasing concern about the effects of nitrogen fertilizer on the environment, especially ground water quality. This concern has been intensified by reports of NO_3 - N of greater than 10 ppm in several locations in eastern South Dakota, especially where aquifers are shallow and soils are very coarse. In some instances, nitrogen fertilizer moving below the root zone has been implicated.

This nitrogen management experiment was established to study the effects of N rates in a corn-soybean rotation on nitrogen movement below the root zone. In most situations in South Dakota, if nitrogen moves below the root zone it stays there and only rarely moves back up. Therefore, once out of reach of crop roots, NO_3 - N has the potential to move down to the groundwater with percolating water during wet periods.

MATERIALS AND METHODS

This nitrogen management experiment was established on the Southeast Research Farm near Beresford in 1988. It is located on an Egan silty clay loam soil. Egan soils are well drained soils formed in silty drift over glacial till.

Corn was planted on the site in even numbered years since 1988 and soybean was planted in the odd numbered years. The rates and timing of nitrogen fertilizer applied to the corn in 2000 are listed in Table 1. The treatments included a check (no N), the recommended rate applied in fall, spring or split between spring and 7 leaf stage and 200 and 400 lb rates spring applied regardless of the previous soil test. These treatments were applied to the same plots each year that corn was planted in the rotation. The recommended rate, was adjusted according to the NO_3 - N soil test level and for credit given to the previous years' soybeans (1 lb N credit for 1 bushel beans). The recommended nitrogen rate was 123, 62, 90, 95, 95, 110, and 125 lb/ac respectively for the even numbered years 1988 through 2000. Nitrogen was broadcast as urea and immediately incorporated by tillage except the fall application was not incorporated until the following spring. The June portion of the split application was surface broadcast ammonium nitrate. Ammonium nitrate was used for this treatment to prevent volatilization losses. Since soybean was the 2001 crop, no nitrogen was applied in 2001.

Phosphorus, potassium and pH soil test levels at the site are 8 and 245 ppm and 5.9 respectively. A randomized complete block design was used on this experiment with four replications. Plot size was 15 feet by 65 feet.

Soybean was planted on May 16 in 30 inch rows. The site had been chiseled in the fall of 2000 and disced prior to planting. Plots were harvested with a field combine. Soil samples were taken to a depth of 5 feet in one-foot increments on May 10, 2001 and to 6 feet in one-foot increments on October 18, 2001. Four cores were taken per plot and replicates combined for nitrate analysis. Only the 0, spring recommended (125 lbs), 200 and 400 lb/ac N treatments were soil sampled.

RESULTS AND DISCUSSION

Soybean yields ranged from 38 bushels per acre where no nitrogen had been applied to the previous corn crop to 43 and 42 bushels where 200 and 400 lb per acre nitrogen had been applied to previous corn crop (Table 2). This trend (Pr >F=0.18) toward increasing soybean yields when grown on high residual nitrate levels had been observed at this site in two of the previous six years soybean had been grown.

Rainfall for the 2001 growing season (October, 2000 thru September, 2001) was near the long term average of about 26 inches (Table 3). However, an extremely wet April (5.2 inches) moved residual nitrate from the 2000 growing season down 2 to 3 feet in the profile (Tables 4 and 5). The fall 2000 nitrate soil test in the top foot of the 400 lb/ac nitrogen treatment was 162 lb/a with only 30 and 23 lb/a respectively in the 2nd and 3rd foot (Table 4). When resampled on May 10, 2001, the top food had only 36 pounds remaining, with the bulk of the nitrate (218 lb) in the 2 to 4 foot depths (Table 5). Fall sampling indicated deeper movement of nitrate, with the largest amount of nitrogen (202 lb) in the 4 to 6 foot depth.

These plots will be rotated back to corn and nitrogen fertilizer rates applied again in 2002. Soil samples will be taken in the fall to determine the amount and location of residual soil nitrate. Corn and soybean yields and soil tests from previous years of this study can be found in the Southeast Farm Progress Reports and in the Plant Science Department Soil/Water Science Research Annual Reports.

Table 1. Nitrogen Fertilizer Treatments Applied in 2000, Nitrogen Fertilizer Management Study; Southeast Research Farm; Beresford, SD.

	Time of Application		
Treatment	Spring[1]	Split[2]	Fall[3]
No.	---------------------------- lb N/ac ----------------------------		
1	0	-----	-----
2	125	-----	-----
3	30	95	-----
4	-----	-----	125
5	200	-----	-----
6	400	-----	-----

[1] April 24, 2000
[2] June 15, 2000
[3] November 22, 1999

Table 2. Nitrogen Management Study Soybean Yields, Southeast Research Farm; Beresford, 2001.

Time	Nitrogen Rate (2000)	Soybean Yield
	lb/ac	bu/ac
Check	0	38
Fall[1]	125	39
Spring[2]	125	41
Split[3]	125	40
Spring	200	43
Spring	400	42
Pr > F		0.18
CV%		7.5
LSD .05		4.6

[1] Fall = 11/22/99
[2] Spring = 4/23/00
[3] Split = 30 lb 4/23/00, 95 lb 6/15/00

Table 3. Rainfall at the Southeast Farm; Beresford, Nov. 1, 2000 to Oct. 31, 2001.

Nov[1]	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
inches											
3.1	0.3	1.4	0.5	0.4	5.2	3.1	1.5	4.5	1.3	3.2	0.9

[1] 2.7 inches rain between 10/10/2000 sampling and 11/1/00

Table 4. Fall Nitrate Soil Test Levels, Nitrogen Management Study; Southeast Research Farm; Beresford, SD.

	Fertilizer N Applied, 1988, 1990, 1992, 1994, 1996, 1998, 2000 lb/ac							
	- - - - 0 - - - -		Recommended[1]		- - - 200 - - -		- - - 400 - - -	
Depth	2000	2001	2000	2001	2000	2001	2000	2001
feet	- - - - - - - - - - - - - - - - - - - Soil NO_3 - N, lb/ac[2] - - - - - - - - - - - - - - - - - - -							
0 – 1	22	40	42	35	73	35	162	36
1 - 2	6	19	15	21	24	19	30	43
2 – 3	10	16	13	24	17	25	23	56
3 – 4	13	20	19	33	34	41	77	75
4 – 5	11	21	19	29	40	52	81	98
5 - 6	10	18	23	33	55	54	74	104

[1] Rates applied were 123, 62, 90, 95, 95, 110 and 125 lb N/acre in spring of 1988, 1990, 1992, 1994, 1996, 1998, and 2000 respectively.
[2] Soil sampling dates: Oct. 10, 2000, Oct. 18, 2001

Table 5. Nitrate Soil Test, High Nitrogen Rate, 2001 Growing Season, Nitrogen Management Study; Southeast Research Farm; Beresford, SD.

	Sampling Date[1]		
Depth	October 10, 2000	May 10, 2001	October 18, 2001
feet.	-------------------- Soil NO_3-N, lb/ac -----------------------------		
0-1	162	33	36
1-2	30	56	43
2-3	23	120	56
3-4	77	98	75
4-5	81	86	98
5-6	74	-----	104

[1] 400 lb Nitrogen per acre applied May, 2000

APERFORMANCE OF WHITE FOOD CORN HYBRIDS IN SOUTHEASTERN SOUTH DAKOTA

P. B. Beauzay and Z. W. Wicks, III

Plant Science 0113

The corn-breeding project at South Dakota State University continues to participate in the regional Early White Food Corn Performance Test (EWFCPT) coordinated by Larry L. Darrah of the USDA-ARS, University of Missouri, Columbia, MO. This test evaluates yield and other agronomic traits of commercially available and experimental white food corn hybrids. The test is conducted at several locations in the Midwest. The purposes of conducting the test at the Southeast Research Farm are to 1) evaluate the performance and production potential of early white food corn hybrids (DRM 116 or less) in a primary corn production environment in South Dakota and 2) continue to develop an agronomic database to aid in assessing the potential of a white food corn market in South Dakota.

Most commercial white corn hybrids have maturities that are marginal for southern South Dakota. Data indicate that while white corn hybrids flower and reach physiological maturity (black layer) comparable to yellow dent hybrids of the same relative maturity, kernel drydown is significantly slower, possibly due to the high level of corneous endosperm in the kernel relative to the softer dent endosperm. In some cases, drydown can lag two weeks behind comparable yellow hybrids. This is an important problem because high temperature drying of moist grain will cause stress cracks to develop in the kernel, and this is unacceptable to dry millers. Stress cracks could also occur in moist grain in the event of an early hard freeze. Also, moist grain in storage is susceptible to storage molds, particularly *Aspergillus flavis*, which produces a carcinogenic aflatoxin. Therefore, an important project within the corn program at SDSU is the development of very early (DRM 110 days or less) white corn inbred lines. Lines are selected for maturity, yield potential, kernel quality, disease resistance and other agronomic traits including loose husks which aid in kernel drydown and help prevent ear diseases such as *Aspergillus spp.*, *Fusarium spp.*, *Gibberella spp.* and *Diplodia maydis*.

In 1999, we released one very early white corn inbred line, SD 82, through the South Dakota Agricultural Experiment Station. In 2000, we released six inbred lines (SD81, SD83, SD84, SD86, SD87, and SD88) making a total of 13 early white inbred lines (< 110 DRM) released in the past eight years. This represents nearly all of the early white corn germplasm recently released by public breeding programs available for public and industry use.

The 2001 EWFCPT contained 21 white food corn entries and 2 yellow check hybrids. Maturities ranged from 110 DRM to 115 DRM. The test was arranged in a Randomized Complete Block Design with three replications per entry. Entries were planted in 2-row plots with 30 inch row spacing. Plot length was 22 feet with 2 foot alley breaks across the width of the experimental field. Each plot was thinned to a stand of 27,500 plants/ac. Final stand and stalk lodging counts were conducted prior to harvest. Plots were machine harvested and plot weight and moisture recorded. Samples were taken from one replication for milling analysis at the Illinois Crop Improvement Association laboratory (data not available at time of report). All data was analyzed using SAS statistical analysis software (SAS Institute, 1989).

The experiment was planted on 20 May and harvested 31 October. Field management inputs were 120-0-0 fertilizer (40 gal/ac) sidedressed. Frontier herbicide at 1 qt/acre was applied preplant. The previous crop was soybean.

Mean yields and agronomic data are presented in Table 1.

We look forward to continued participation in the EWFCPT and will continue to develop early white corn inbreds and populations. Commercial hybrids suitable to southern South Dakota are currently being developed using inbred lines from our breeding program. Serious consideration should be given to developing a dry milling facility or whole kernel processing facility in this area. This would give producers an alternative market to yellow dent corn.

We gratefully acknowledge the following people and organizations for their efforts and contributions: the South Dakota Corn Utilization Council; Larry Darrah of the USDA-ARS, Columbia, MO; Bob Berg and the staff at the Southeast Research Farm; Kyle Kepner, corn project technician.

Table 1. Mean yields (bu/acre), % grain moisture, and DRM of entries in the 2001 EWFCPT, Southeast Research Farm, Beresford, SD.

Entry	Yield	%H_2O	DRM
IFSI 95-2	158.2	20.3	112
Pioneer Brand 32K72	148.8	22.3	114
Pioneer Brand 3394 (yellow check)	132.4	19.2	110
Pioneer Brand 34P93	131.4	19.1	111
Asgrow RX776W	128.1	22.6	114
Vineyard V445W	126.7	26.2	115
Zimmerman E8272	125.1	25.7	115
Pioneer Brand 32H39	121.7	20.6	115
Pioneer Brand 33T17	120.9	21.5	113
Monsanto EXP 162W	120.6	19.4	112
NC+ RE557W	117.8	21.2	114
Vineyard Vx6122W	117.4	21.0	112
Vineyard V433W	113.4	23.1	114
Whisnand 50AW	107.8	21.0	111
Vineyard V431W	106.7	20.4	113
Zimmerman 1790W	103.4	26.0	113
Whisnand 100W	102.6	22.9	112
Zimmerman E2010	95.6	21.7	113
Lfy (FR810 x Lfy728W)	92.5	25.8	115
B73 x Mo17 (yellow check)	91.7	20.3	115
Vineyard V420W	91.1	18.3	110
Zimmerman Z75W	89.7	22.1	112
Lfy (MBS62W x Lfy728W)	79.4	23.6	115
Grand means	113.2	22.0	--
LSD (a=.05)	25.5	2.0	--
C.V. (%)	13.1	5.2	--

2001 SOYBEAN SEED TREATMENT TRIAL

Martin A. Draper and Kay Ruden

Plant Science 0114

INTRODUCTION

Soybeans can be damaged early in the season by a number of seedling diseases. As a result of these diseases, emergence may be delayed, early season plant population may be reduced, and root mass may be reduced which could affect late season plant populations. Diseases may be managed with seed treatments, especially if they are planted early in cold, wet soils, or if a severe rain event follows planting. Species of *Pythium*, *Rhizoctonia*, and *Fusarium* fungi can all cause early season pre-emergence and seedling diseases. Similarly, non-pathogenic fungi may cause emergence problems if the seed sits in a cool, wet seedbed for an extended period of time.

All fungicides do not address the same problems. Most products will suppress nonpathogenic fungi, but certain products may have strength in suppressing certain seedling-disease fungi. Seed treatment fungicides containing metalaxyl or metalaxyl-like compounds such as mefanoxam, are active against oomycete fungi, which include *Pythium* and *Phytophthora*. Other products have little or no activity against these fungi. Products containing captan have general antifungal activity, while PCNB (pentachloronitrobenzene) has its best activity against *Rhizoctonia* and TBZ (thiabendazole) has its peak activity against *Fusarium*, in addition to having general fungicidal activity against fungi other than oomycetes.

MATERIALS & METHODS

The variety 'Hardin 91' was selected for this study because it carries a specific resistance gene (Rps 1k) for protection against races 3 & 4 of *Phytophthora sojae.* This genetic resistance should have minimized Phytophthora root and stem rot as a confounding factor as the season progressed. ‘Hardin 91’ has a relative maturity of about 1.8, making it an early variety for the southern part of the state, but adapted to northern counties in SD, as well.

The experiment was planted as a randomized complete block (RCBD) with six replications of each treatment. The plot was planted, rated and harvested on the dates listed in Table 1. Plants were rated for early plant population (stand), late plant population, and yield. Fungicide seed treatments in this evaluation (Table 2) included Rival plus Allegiance, SoyGuard, Stiletto, an experimental fungicide, Maxim plus Apron XL in its commercial formulation as well as the on-farm treatment that is sold as Apron Maxx, and Allegiance at a high rate. These treatments were compared to an untreated check. The Southeast Farm location was grown under natural conditions and the Brookings location was irrigated with 1.5 inches of water 10 days after planting (May 27-28).

The trial was conducted at the Southeast Research Farm (SERF) near Beresford, SD, and the SDSU Experiment Farm at Brookings.

RESULTS AND DISCUSSION

There were no significant differences among treatments for stand or yield in this study at the SERF location where dry conditions prevailed (Table 3). As such, no clear conclusions can be drawn as to the effectiveness of seed treatments at this location in 2001. In Brookings, conditions were also quite dry, if not for the initial irrigation. Very wet conditions are most conducive to the development of Pythium seedling blight. Wet conditions, followed by a dry, stressful environment favor Rhizoctonia seedling blight.

At Brookings, significant differences were noted among the treatments. Apron Maxx RTA significantly improved the late stand. Yields were significantly improved by SoyGuard, Maxim/Apron (commercial), Stiletto, Apron Maxx RTA, and Allegiance (high rate). However, while these higher yields were significantly greater than the untreated check and numerically different, they were not significantly different from one another.

Soybean seed treatments in other years and other locations have show the best response on no-till sites and in years where there is heavy rainfall within a few days after planting. The irrigation of the Brookings site would seem to support this observation. In 2001, neither of the sites had significant rainfall events for more than a week following planting.

ACKNOWLEDGEMENT

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Table 1. Dates and timing of planting, stand counts, disease evaluations and harvest at study locations.

	Date of activity by location	
Activity	SE Research Farm	Brookings AES
Planting	May 16, 2001	May 17, 2001
Early stand count	June 18, 2001	June 11, 2001
Late stand count	August 15, 2001	August 7, 2001
Harvest	October 19, 2001	October 16, 2001

Table 2. Rates of fungicides applied as soybean seed treatments in 2001 trial.

Treatment (product)	Treatment (active ingredients)	Rate
Untreated check	n/ac	n/ac
Rival + Allegiance	captan/PCNB/TBZ/metalaxyl	4.0 fl oz/cwt + 0.2 fl oz/cwt
SoyGuard	azoxystrobin/metalaxyl	0.32 oz/cwt
Maxim 4FS + Apron XL	fludioxonil/mefanoxam	0.08 fl oz wt/cwt + 0.16 fl oz/cwt
Exp A	proprietary	0.125 oz wt/cwt
Stiletto	carboxin/metalaxyl	6.7 fl oz wt/cwt
Apron Maxx RTA	fludioxonil/mefanoxam	6.25 g ai/cwt
Allegiance	metalaxyl	0.375 fl oz/cwt

Table 3. Stand and yield associated with various seed treatments at Beresford, SD.

Seed Treatment	Early stand count (plants/ac)[a]		Late stand count (plants/ac)		Yield (bu/ac)	
	SE Farm	Brookings	SE Farm	Brookings	SE Farm	Brookings
Untreated	150,304	115,451	165,007	124,981	35.38	25.22
Rival/Allegiance	163,101	102,653	170,454	117,084	36.12	30.20
SoyGuard	159,289	107,554	169,092	133,694	37.18	36.34*
Maxim 4FS/Apron XL	147,308	105,104	167,730	113,816	36.37	37.68*
Exp A	148,398	110,822	159,289	141,046	34.08	29.76
Stiletto	156,022	113,000	168,819	111,094	33.95	33.90*
Apron Maxx RTA	152,754	112,455	163,101	158,745*	37.19	39.97*
Allegiance	154,388	86,704	173,176	103,275	31.62	40.11*
LSD (0.05)	NS[b]	NS	NS	31,496	NS	6.9

[a] plants/acre is a per acre plant population based on the number of plants counted in 8 feet of row
[b] NS = no statistically significant difference among values
* Indicates a significant improvement over the untreated check

SE FARM REPORT SDSU

SOYBEAN CYST NEMATODE STUDIES, 2001

James D. Smolik

Plant Science 0115

OBJECTIVES

- Continue survey for soybean cyst nematode (SCN) in South Dakota.
- Determine effect of SCN on soybean yields.
- Evaluate experimental lines for sources of SCN resistance.

RESULTS

Survey: Approximately 800 samples were processed for soybean cyst nematode over the 2001 growing season. This was a similar number to last year and the number of SCN-positive samples was 24%, which was less than the 33% positive recorded in 2000. No new counties were detected in 2001, and the number of counties where SCN has been detected remains at fifteen. These counties are principally the eastern and southeastern border counties. The highest SCN population densities recorded this year were in three southeastern counties: Clay, Turner, and Union. Several new locations for SCN were recorded this year in these three counties, and in numerous instances populations of SCN were very high and significant yield reductions were reported.

Test Plots: A strip test was conducted in a cooperator's irrigated field in Turner County. The yield of both of the SCN-resistant varieties was more than double that of the SCN-susceptible variety (Table 1). The population density of SCN declined substantially over the growing season on both of the resistant varieties, and was 87-92% lower than the susceptible variety.

Table 1. Soybean yields and SCN populations in Turner County strip trial.

Entry	Response to SCN	Yield (Bu/A)	No. of SCN eggs + J-2 per 100 cm^3 soil at harvest\[d]
DKB 26-52	R	38.2\[a]	950
92B37	R	35.6\[b]	633
92B23	S	15.0\[c]	7540

\[a] Average of 2 replications \[b] Average of 3 replications
\[c] Average of 5 replications
\[d] Population density of SCN at planting was 5425 eggs + J-2 per 100 cm^3 soil.

A small plot test was conducted in a non-irrigated field in Turner County in cooperation with Roy Scott, SDSU soybean breeder. This test was designed to measure reproduction of SCN on experimental lines from regional breeding programs as well as public and private varieties. It was very dry in the Hurley area where this test was conducted, and only 6 inches of rain was recorded from May through August. The dry conditions reduced soybean yields and also limited reproduction of SCN. The SCN-resistant lines yielded more than the two susceptible checks, but in most instances the differences were not statistically significant (Table 2). The population densities of SCN at harvest were much lower on the resistant varieties compared to the susceptible. However, the numbers were less than those measured at planting, apparently a result of the very dry conditions. The same set of lines was also planted at the SE Experiment Farm in a field that was not infested with SCN. Rainfall was more abundant at the SE Farm and average yields were much higher (Table 2). Interestingly, the highest yielding line in the SE Farm test was a SCN resistant variety.

Table 2. Soybean yields and SCN populations in the Turner County test and yield at SE Research Farm.

Entry	Response to SCN	Yield (Bu/A)		No. of SCN eggs + J-2 per 100cm^3 soil in Turner Co. at harvest\[b]
		Turner Co.	SE Farm	
Exp-4	Exp	35.2\[a]	46.4\[a]	125\[a]
Turner	R	35.0	46.6	163
Exp-2	Exp	34.8	40.9	250
Exp-5	Exp	34.2	44.1	63
Loda	R	34.2	42.6	175
Dwight	R	34.2	52.0	213
Exp-1	Exp	33.5	48.9	275
MN0902CN	R	32.8	39.4	75
SD98-716	Exp	30.3	37.1	400
SD98-713	Exp	29.7	36.3	113
Exp-3	Exp	29.5	51.3	1250
IA2021	S	29.5	47.3	3025
IA2050	S	28.4	50.4	1613
SD98-1430	Exp	27.3	32.4	138
$LSD_{0.05}$ =		5.6	5.7	

\[a] Average of four replications.
\[b] Population density of SCN at planting was 4800 eggs + J-2 per 100 cm^3 soil. The SCN was not present in the SE Farm test location.

A second small plot test in Turner County measured soybean yield and SCN populations in a field where SCN resistant or susceptible varieties had been planted the previous two years. Continuously cropping soybean is not recommended, especially where SCN is present, but questions occasionally arise concerning the long-term effects. The dry conditions again limited soybean yields and reproduction of SCN. There was little difference in yield between the varieties, and populations of SCN did not increase on the susceptible variety (Table 3). Numbers of SCN on the resistant variety at harvest were about six to eight times higher than those measured on the resistant varieties in the previous two years. This increase may, perhaps, be an indication that the SCN populations in the plots continuously cropped to a resistant variety are beginning to adapt to these varieties.

Table 3. Soybean yields and SCN populations in Turner County rotation study.

Previous Crop	Soybean Line	Yield (Bu/A)	#SCN eggs + J-2 per 100 cm^3 soil at harvest
Resistant Soybean	92B37 (R)	19.3\[a]	858\[b]
Susceptible Soybean	92B23 (S)	18.8	3950

\[a] Average of 6 replications
\[b] Average number of SCN eggs + J-2 per 100 cm^3 soil at planting was: R= 325, S= 12,583

ACKNOWLEDGEMENT

This research was supported in part by the South Dakota Soybean Research and Promotion Council.

SE FARM REPORT
SDSU

COMPARISON OF BT-CORN AND FIPRONIL (REGENT 4 SC) AGAINST THE BIVOLTINE ECOTYPE OF THE EUROPEAN CORN BORER

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Plant Science 0116

INTRODUCTION

Fipronil, the active ingredient in an insecticide called Regent 4 SC (Aventis CropScience USA LP), is a phenyl pyrazole compound used as a contact and stomach poison insecticide. Regent 4 SC is currently sold to corn growers as a soil insecticide (applied in-furrow with the corn seeds at planting) to control larvae of corn rootworms and other soil-inhabiting insect pests of corn. What is unique about Regent 4 SC is the claim on its label that it also controls larvae of the first-brood European corn borer that infest the corn plant several weeks after planting. First brood corn borer larvae hatch out of eggs laid by moths on the leaves of whorl-stage or knee high corn.

South Dakota counties along and to the south of Interstate 90 have the bivoltine ecotype or two-generation-per-year European corn borer. The first- and second-brood moths and larvae are clearly identifiable in these areas. Moths that give rise to first-brood larvae are numerous in mid-June, while moths that give rise to second-brood larvae peak in mid-August. Very few moths are present in July. Long-term studies have indicated that the first-brood larvae cause the most yield loss in corn if present in economically significant numbers.

Although Regent 4 SC claims on its label that it controls first-brood European corn borer larvae, it is not known whether enough fipronil remains in the corn plant to control the larvae of the second-brood corn borer in the corn leaves, stalks, ear shanks, and ears. This research was conducted to investigate the efficacy of fipronil against the first- and second-brood corn borer larvae in southeastern South Dakota. We compared fipronil against a Bt-corn hybrid expressing the YieldGard gene that provides season long protection against corn borers.

Similar research was also conducted in 2001 at the Northeast SD Research Station near South Shore to verify the efficacy of Regent 4 SC against the univoltine ecotype corn borer that occur in northern South Dakota. Please refer to the *2001 Northeast South Dakota Research Station Progress Report* for comparison.

MATERIALS AND METHODS

All experiments were conducted at the Southeast Research Farm near Beresford during the 2001 growing season. The following treatments were tested:

1) Bt-corn (H9230Bt, 113 day RM).
2) Untreated Non-Bt corn (H2547, 112 day RM)
3) Non-Bt corn (H2547, 112 day RM) treated with Regent 4 SC (in-furrow at planting) using the ONE-PASS Application System. The rate was at 4.2 liquid ounces of Regent 4 SC per acre mixed with 3 gallons per acre of water. The tank pressure was at 23 p.s.i. with the tractor traveling at 4 m.p.h.

The corn seeds were planted using a 6-row White 5700 planter on May 9, 2001. Plant population was 26,900 seeds per acre. Each treatment listed above was replicated four times and assigned in a randomized complete block fashion on each experimental unit. Each experimental unit was composed of six rows (115 ft. long) spaced 30 inches apart. One row per plot was destroyed and dissected for corn borer injuries. Three rows were kept intact then harvested at the end of season (October 16, 2001).

Ten consecutive plants on one row were dissected on July 1 (for first-brood larvae) and September 25-28 (for second-brood larvae) using a curved knife and examined for corn borer larval tunnels, tunnel length, and live corn borer larvae in the stalk, ear shank, and ear. Data were analyzed using SAS statistical analysis software (SAS Institute) after appropriate data transformations to normalize the data.

Activities of corn borer moths at night were monitored with a light trap equipped with a 15-watt "black light" fluorescent bulb. An insecticide-impregnated rubber strip (dichlorvos) was placed in the collection container of the trap to quickly kill all insects attracted to the light trap. The light trap operated 24 hours a day during the growing season (May 14 to September 14). Corn borer moths collected by the trap were counted regularly.

RESULTS AND DISCUSSION

Corn borer moth flight: The first-brood European corn borer moth flight occurred from June 6 through June 29, while the second brood moth flight occurred from mid-July through mid-September (Figure 9). The first-brood moth flight was similar to the 1996-1997 first-brood moth flight, while the second-brood moth numbers were the highest recorded since 1996.

Based on six years of data (1996-2001), we think that most of the yield loss in corn in bivoltine areas is caused by the first-brood moths if the numbers were sufficiently high, and the weather is right. Corn borer moths are very sensitive to nighttime temperatures and cold (low to mid-40's) weather in June can disrupt the moth flight and egg laying of the moths (e.g., during the 1998-99 seasons). Historical moth flights at the Southeast Research Farm can be found online at the South Dakota State University Extension Entomology Web site (www.abs.sdstate.edu/plantsci/ext/ent).

Yield: No significant yield advantages over untreated non-Bt corn were recorded both in the Bt hybrid, and the non-Bt hybrid treated with Regent 4 SC (Figure 1). The Regent 4 SC treatment had about 2 bushels per acre yield advantage over its untreated counterpart, while the Bt corn hybrid offered no yield advantage. The moisture content of grain at harvest was statistically similar among the treatments (Figure 3). In terms of gross income, the Regent 4 SC treatment produced an advantage of $7.83 per acre (Figure 2).

Stalk injury: Most of the injuries were caused by the second-brood late in the season (Figures 5-8). At the end of the season, about 85% of the stalks in the untreated non-Bt corn had tunnels in them (Figure 6). Only 25% was due to the first-brood (Figure 5).

To reiterate, our data from 1996-2001 do indicate that the first-brood larvae have the most potential cause yield loss. In this current study, the reason for no significant improvement in yield either by growing Bt corn or applying Regent 4 SC may be due to low injuries to the stalks by the first-brood larvae. Significant injuries to the stalks and ears due to the second-brood late in the season did not apparently reduce yield.

Regent 4 SC, at the rate used in this research appeared to suppress both the first- and second-brood larvae (Figures 5-6). The corn plants treated with Regent 4 SC at planting had 7.5% fewer infested stalks compared with the untreated non-Bt hybrid in July (due to first-brood larvae), and 27.5% fewer infested stalks overall (due to combined first- and second-brood larvae). These reductions in percent infestation were quite modest compared to the protection offered by the YieldGard gene in the Bt hybrid (Figures 5-6).

Figures 7-8 show the tunnel lengths per infested stalk. It is the average cumulative length of all the tunnels found per infested stalk caused by however many corn borer larvae. Tunnel lengths in the infested Bt corn did not exceed 1 inch. Overall (i.e., due to combined first- and second-brood larvae), the tunnel length per infested stalk in the Regent 4 SC treatment was 2 inches less than the untreated non-Bt hybrid. Average tunnel length in the untreated non-Bt was about 7 inches long per infested stalk (Figure 8).

Ear shank injury: The second-brood larvae infested over 20% of the ear shanks in the untreated non-Bt corn hybrid (Figure 4). Corn plants treated with Regent 4 SC had a small (not statistically significant) reduction in ear shank infestation of 5%. No infestation was observed in the ear shanks of the Bt corn hybrid.

SUMMARY

Regent 4 SC provided a moderate (27.5% reduction in corn borer infestation of the stalk due to combined first- and second-brood European corn borer larvae) but statistically significant protection against bivoltine corn borer larvae. A yield advantage (not statistically significant) of 2 bushels per acre, and a $7.83 per acre gross income were also recorded over untreated non-Bt corn. Regent 4 SC was applied at planting using the ONE-PASS liquid application system at the rate of 4.2 fluid ounces (in 3 gallons of water) per acre.

ACKNOWLEDGMENT

This study was supported in part by Aventis CropScience through George Simkins. Corn seeds were provided by Joe Schefers of J.C. Robinson Seed Company. We thank the staff at the Southeast Research Farm for agronomic and technical support.

Fig. 1. Yield (bushel per acre)
at 15% moisture

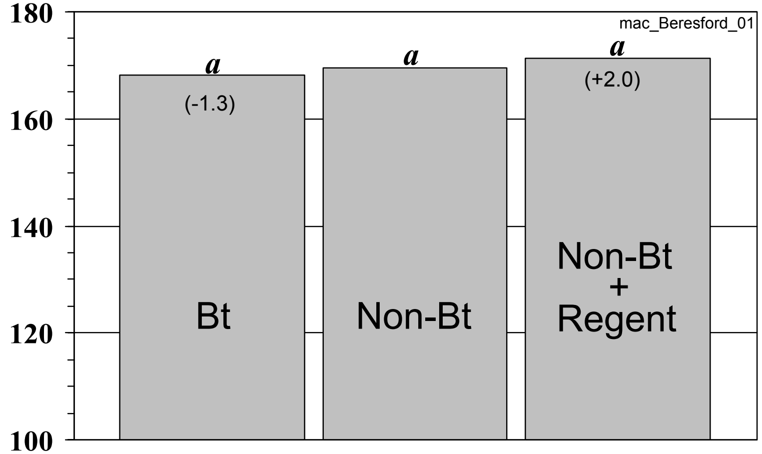


Fig. 2. Gross income ($ per acre)

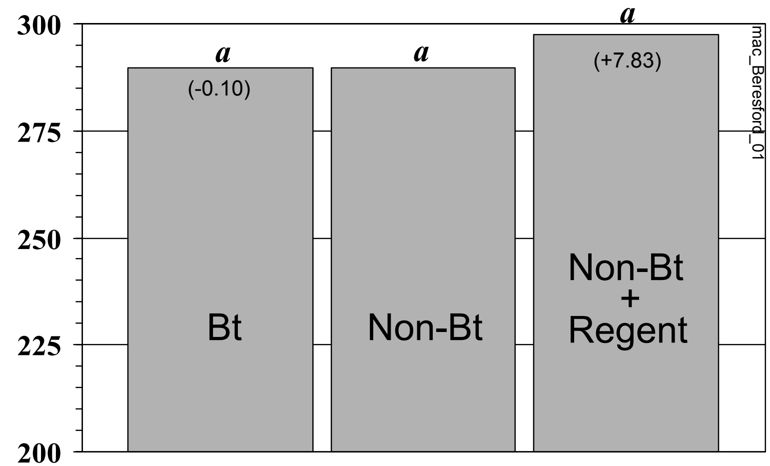


Fig. 3. Grain moisture content (%)
at harvest

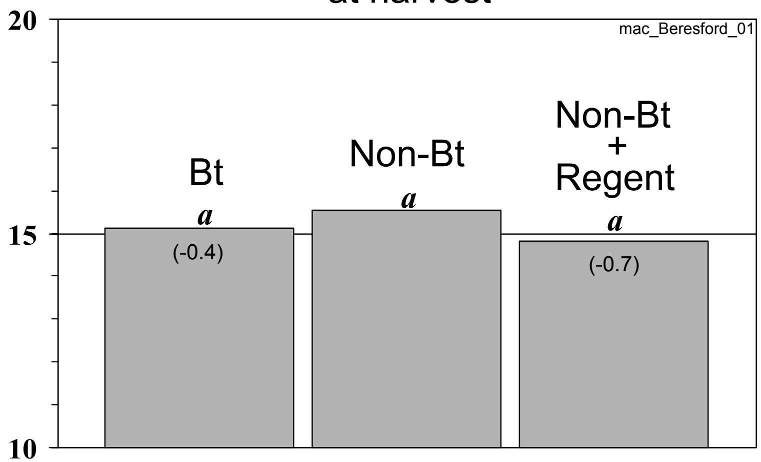
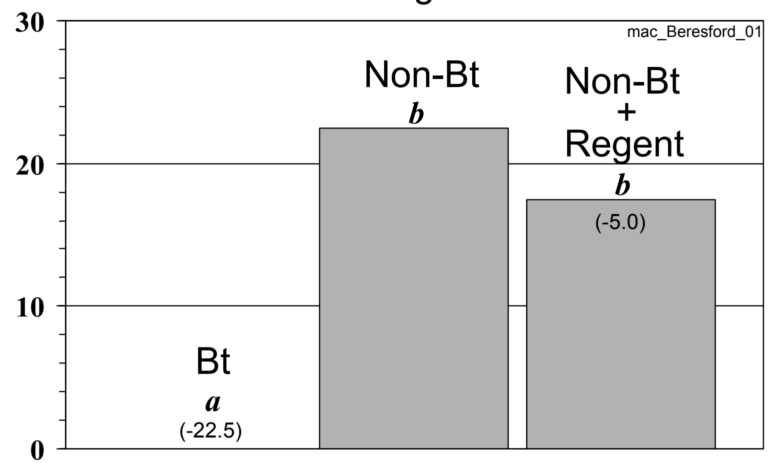


Fig. 4. Ear shank with tunnels (%)
Due to 2nd gen. larvae



Note: *Bars within a figure with the same letter on top are not statistically different (apparent differences may be due to chance alone).*

Fig. 5. Stalks with tunnels (%)
Due to 1st generation larvae

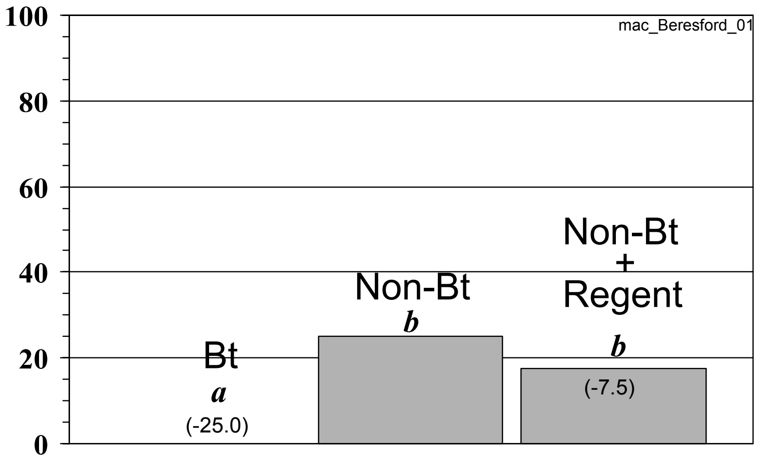


Fig. 6. Stalks with tunnels (%)
Due to combined 1st and 2nd gen. larvae

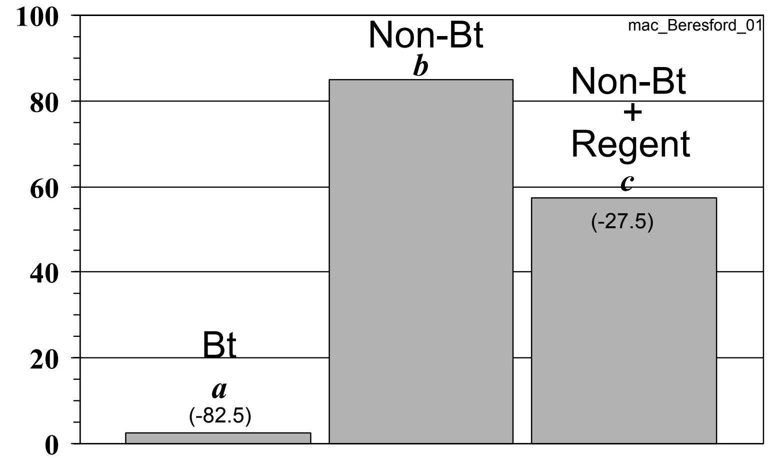


Fig. 7. Avg. tunnel length (inches)
Due to 1st generation larvae

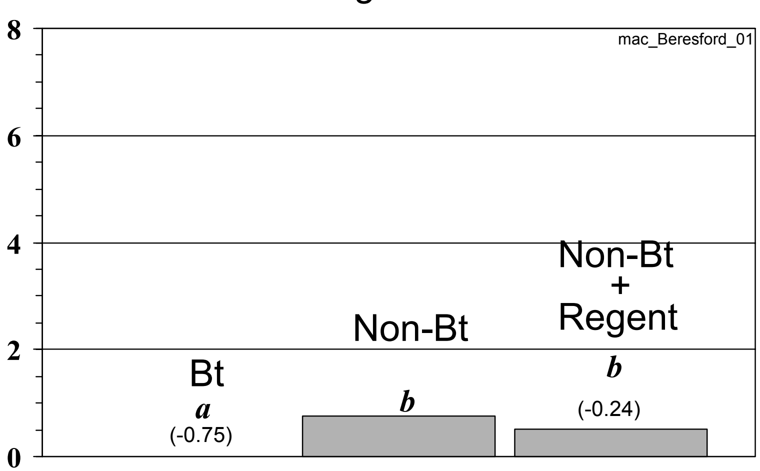
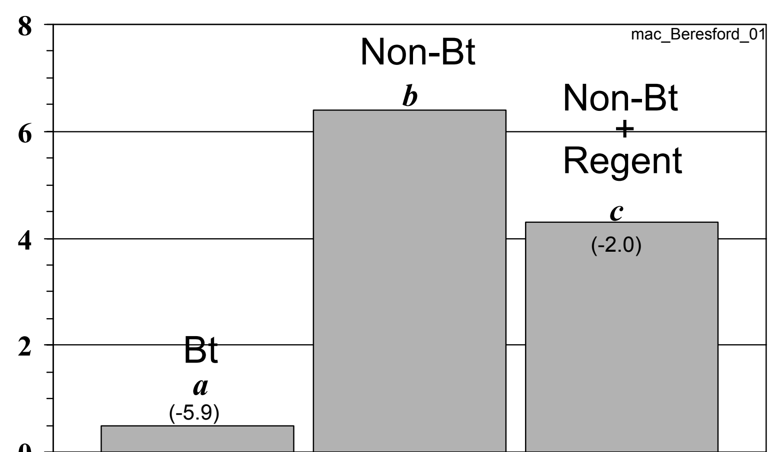


Fig. 8. Avg. tunnel length (inches)
Due to combined 1st and 2nd gen. larvae



***Note:** Bars within a figure with the same letter on top are not statistically different (apparent differences may be due to chance alone).*

Fig. 9.

Corn Borer Moth Flight in Beresford, SD 2001

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South Dakota State University
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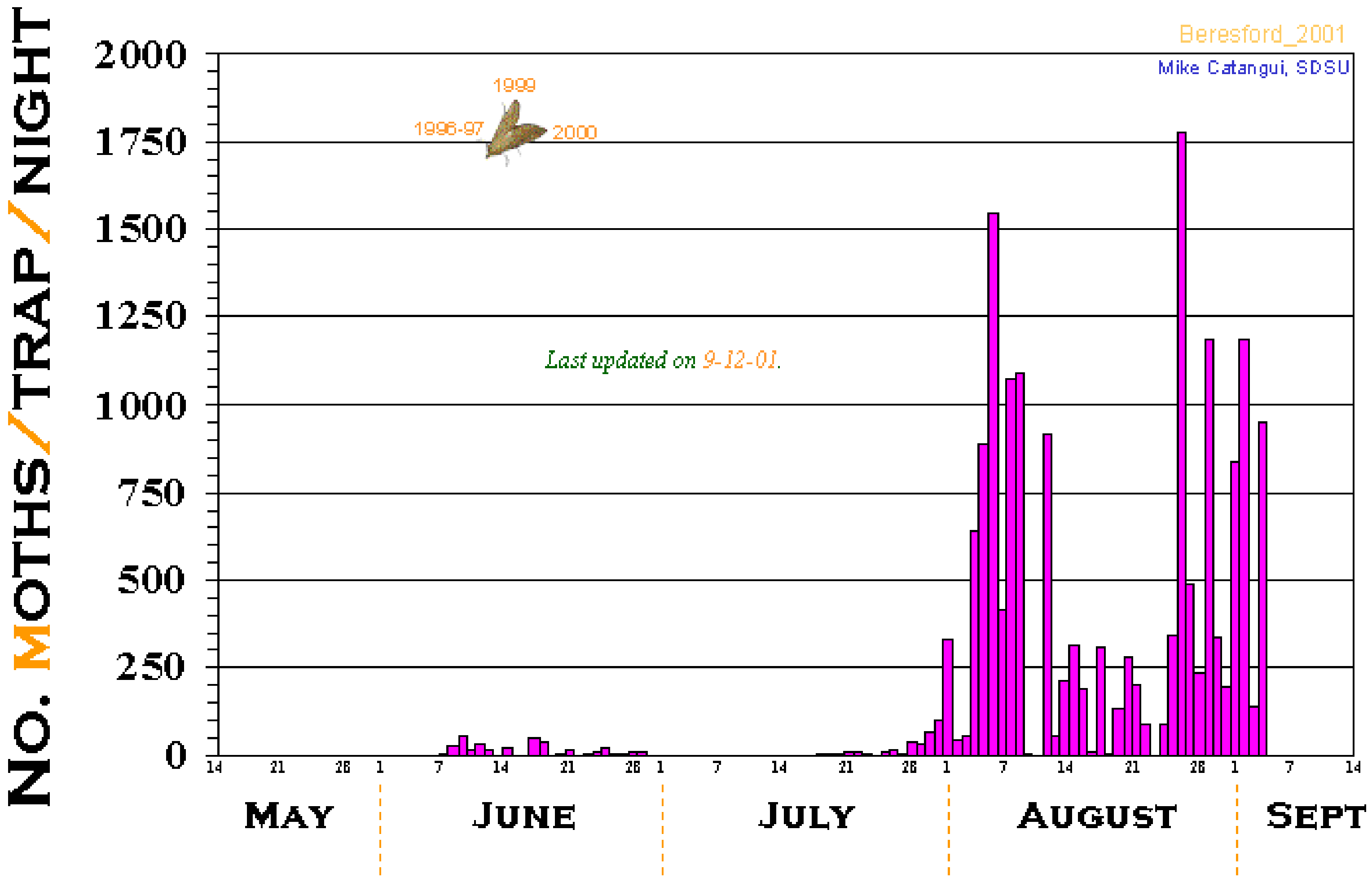
www.abs.sdstate.edu/plantsci/ext/ent/ecb/ecb2001_bere.htm



USING ARTIFICIAL DEFOLIATIONS TO MEASURE THE IMPACT OF VARIOUS INSECT PESTS OF SOYBEAN IN SOUTH DAKOTA

D.L. Mills, M.A. Catangui, C. Reese,
C. Gustafson, R. Berg

Plant Science 0117

INTRODUCTION:

Soybean plants can be damaged during the growing season by a number of insect pests. As a result the maturity may be delayed and yield reduced. Scouting for insect damage can be time consuming and costly. Aerial imagery may be a valuable tool in the diagnosis of insect damage on soybean during critical stages of growth, flowering and pod fill. Through aerial imagery it may be possible to determine percent defoliation for an entire soybean field. This study is an attempt to qualify this assumption.

MATERIALS AND METHODS

The soybean field studied the summer of 2001 was at the Southeast Research Station near Beresford S.D. The study was comprised of four repetitions of seven treatments. Each plot was 18 rows wide (45') by 45' long. In each rep five plots were subdivided. Rows and plots ran south to north. Row count started from the western most rows in each treatment plot numbering 1 to 18.

Treatments:

A) **No treatment** – control
B) **Complete treatment** – We sprayed approximately every two weeks with Sevin XLR at the recommended rate of one quart per acre with a hand held sprayer
C) **100% defoliated at full bloom and pod fill** – The field was sprayed prior to full bloom. Then at full bloom the west half of the 100% treatments were defoliated. The leaves were trimmed with an electric hedge trimmer. Defoliation was accomplished by trimming the leaves from each side of the row then the top of the row. We left, as much as possible, the flowers intact. This was repeated for each row within each treatment plot.
D) **50% defoliated at full bloom and pod fill** – This was accomplished by trimming the west side of each row of plants by approximately cutting the plant in half. Care was given to ensure the minimal loss of flower blooms and bean pods. The same equipment was utilized as in treatment C.
E) **10% - 15% defoliated at full bloom and pod fill** – This was accomplished by trimming the

west side of each row of plants by approximately cutting 10% to 15% of the vegetation off. The same equipment was utilized as in treatment C.

F) **10%, 50%, and 100% defoliated at vegetative the stage** – One plot in each rep was subdivided into three plots of 6 rows wide by 45’ long. Each treatment of 10%, 50%, and 100% defoliation was randomly selected. The same equipment was utilized as in treatment C.

G) **Inoculate treatment** – One plot in each rep was subdivided into four sub plots. Treatments consisted of hand, high pressure, low pressure, and no inoculation.

Leaf Reflectance:
The light reflectance of each plot was scanned five times using a “Crop Scan Multispectral Radiometer”. The field was scanned two separate times, we are still analyzing this data and it will be forth coming at a later date.

Leaf Area Data:
A total of ten plants from each treatment in row 1 and row 10 for two sub plots, rows 1, 7, and 13 were taken intact, roots and all. These plants were measured for height, leaf and pod count. The leaves of each plant were individually scanned recording total leaf area, length, width, max width, and average width for each leaf using a portable leaf area meter the Licor Li-3000A. This data helps us to determine percent of the area of leaf lost to insect defoliation.

Fly Over:
There were two aerial images taken on 07-20-01 and 08-17-01. These utilized 4 bands of light red, yellow, and blue, including NIR. This data is still being analyzed and will be forth coming at a later date.

Insect Counts:
Bean Leaf Beetle (BLB) and Grasshopper sweeps were taken on 07-15-01 and 08-17-01. This was accomplished by sweeping 180 degrees through the top two thirds of the vegetation for a total of 20 sweeps per plot.

RESULTS AND DISCUSSION

Yield data are presented in Figure 1. Data represented by each bar are averages of 4 replicates and have not been statistically analyzed. Percent defoliations on the graph were levels attempted and subject to change as we measure the actual defoliation levels using an electronic leaf area meter. For example, the actual defoliations during the vegetative stage were 22, 40, and 89% instead of the 10, 50, and 100% attempted defoliation levels.

Our data indicate that soybean plants are quite tolerant of defoliation during the vegetative stages. A 100% (89% actual) defoliation at vegetative stage, for example, still produced 45 bu/ac at harvest. The impact of extensive defoliations were more pronounced as the soybean plants reached the full-bloom and pod-fill stages of development.

Regular spraying with Sevin XLR PLUS did not produce a yield advantage over unsprayed soybeans. This may mean that the number of insect defoliators on the field did not reach economically significant numbers.

ACKNOWLEDGEMENT

This study is supported in part by the North Central Soybean Research Program. We thank the staff at the SDSU Precision Farming Unit and the Southeast Research Farm for agronomic and technical support.

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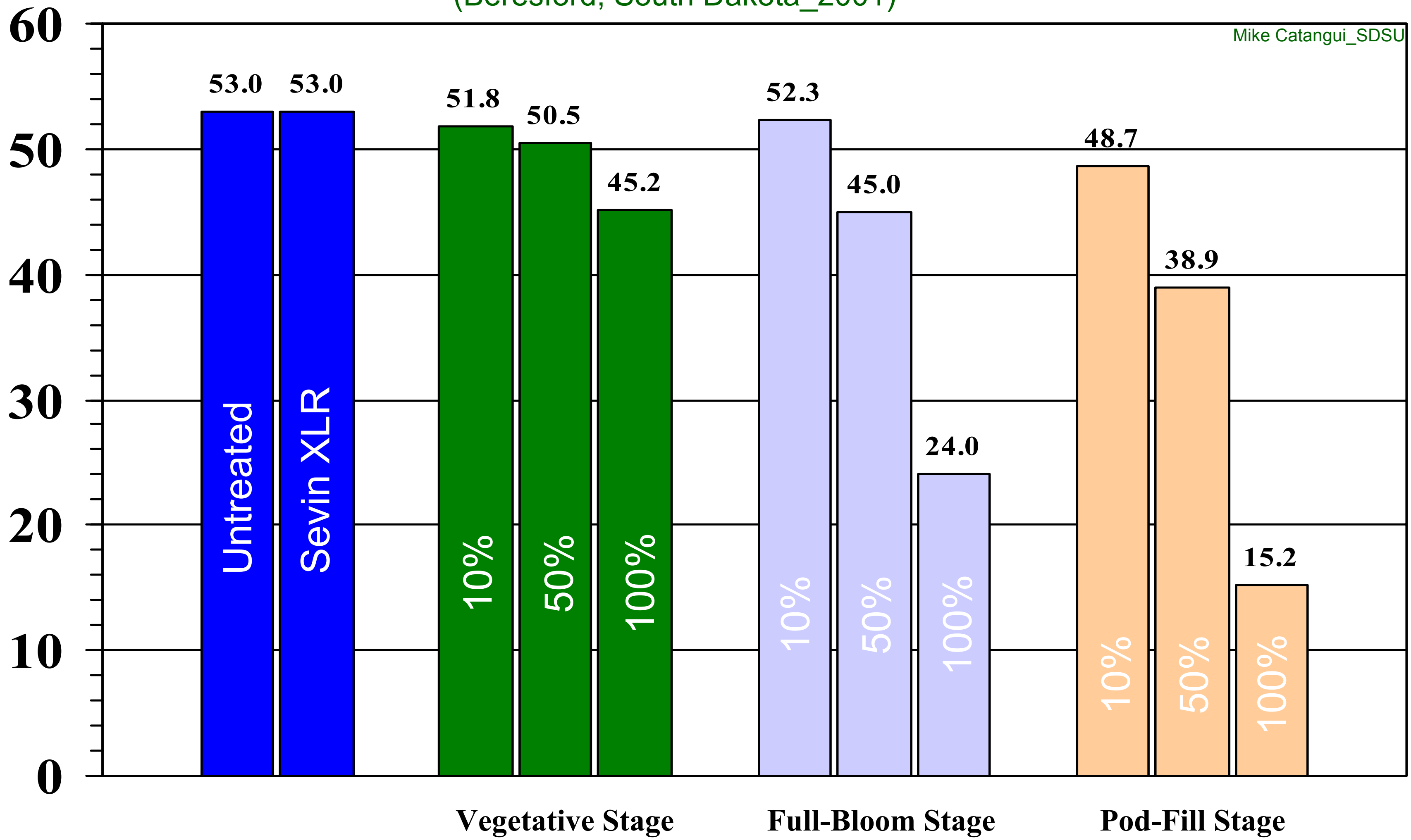
Defoliating soybeans using a shrub trimmer

90% Defoliated Soybean at Full-Bloom

45% Defoliated Soybean at Full-Bloom

Fig. 1. Yield (bu/ac @ 13% moisture) of soybean defoliated at various growth stages to simulate insect damage.

(Beresford, South Dakota_2001)



SE FARM REPORT
SDSU

SOYBEAN BREEDING PROJECT

Project Leader: Roy Scott
Research Associate: Curt Reese
Research Technicians: Steve Stein
and Chris Engbrecht

Plant Science 0118

ROUNDUP READY TESTS

We tested 32 advanced Roundup Ready lines and checks at Southeast Farm in 2001. We used four commercial cultivars as checks. Most lines matured before the killing frost, but some did not. These lines were also tested at two other locations. Southeast Farm produced the highest mean yields of the three locations. Yields ranged from 27-44 bushels/acre at Southeast Farm, 22-41 at Brookings, and 20-36 at Arlington. Many lines at Arlington suffered significant frost damage before maturity. Yields of most lines increased as the location moved further southeast. At Southeast Farm yields of most lines were similar to yield of the highest yielding check, and the mean of all checks. Rankings of the checks and lines were inconsistent across the three locations. The best lines will be advanced for further testing in 2002.

CONVENTIONAL TESTS

We tested 212 advanced conventional lines in three different tests at Southeast Farm in 2001. These lines were also planted at Brookings, but were lost to hail damage before maturity. Test 1 contained 84 lines. Mean yield was 43 bushels/acre in this test, with a range of 32-59. About 6% of the lines were similar in yield to the mean of all checks. Test 2 contained 65 lines. Mean yield was 41.4, with a range of 25-58 bushels/acre. In this test, 43% of the lines were similar in yields to the check mean. Test 3 contained 64 lines. Mean yield in this test was 39 bushels per acre, with a range of 20-56 bushels/acre. About 12.5% of the lines were similar in yields to the mean of all checks.

Our results were disappointing in Southeast Farm Roundup Ready tests in 2001, but since we had other locations, we were able to make selections. We had soil, disease, or other environmental problems in this trial, which may have biased the results for some lines. When all data were considered, at least two Roundup Ready lines were identified for preliminary increase and purification in 2002. Since we only had one location for the conventional lines, we will re-evaluate a larger number in 2002 than we normally would.

OAT RESEARCH

Lon Hall

Plant Science 0119

The most important characteristics for varietal release are yield, yield stability, and test weight; however, there may be several factors that will contribute to the increase of these characteristics. Genetics, lodging resistance, Barley Yellow Dwarf resistance, crown rust, and stem rust resistance all contribute to increased yield and test weight. Some other characteristics that are considered when releasing a variety are hull percent, high protein, high oil, low oil, plant height, maturity, hulled or hulless, and hull color.

The consumers require different characteristics for specific needs. Several millers want a high protein oat; whereas, the livestock producer wants a high oil, high protein, and tall variety. The racehorse industry wants a white-hulled variety or high quality naked oat.

Fifteen breeding and regional nurseries grown at the Southeast Research Farm had a combined total of 1226 plots. The Tri-State regional nursery is made up of 30 lines and 6 checks. The 30 lines consist of 10 advanced lines from each Minnesota, North Dakota, and South Dakota. The best lines will be entered in either the Uniform Early Nursery (UEO) or the Uniform Midseason Nursery (UMO) the following year. The UEO is a regional nursery made up of 27 early maturing lines from breeding programs across the United States. We entered three lines this year, out of these three, one looks very promising for release in 2002. Compared to Don, SD97525 has better test weight, higher yield potential, better crown rust resistance, and a similar maturity. The UMO is made up of 34 advanced medium and late maturing lines, usually 1 to 3 lines (we had three lines) from each of the participating state and Canadian breeding programs. One of the South Dakota lines, SD96024, was the top yielder in the UMO (2000) and the South Dakota Standard Variety Oat Trials in 2000 and 2001. The data collected from the regional nurseries provides valuable information needed for varietal release and germplasm selection for crossing in our program. The most advanced lines in the regional nurseries are simultaneously tested in the Standard Variety Oat trials across the state.

Plant breeding is a long drawn out process. The bulk breeding method takes, on average, at least 10 years from the initial cross to varietal release. This process can be speeded up a couple of years by using the single seed descent method, which involves two extra generations in the greenhouse. Seeds are hand picked from bulk lines (segregating crosses) on basis of color, kernel size, kernel shape, busted tip (thin hull), and in the case of hulless oats a large, hairless, white groat. In the fall greenhouse 500 selected seeds per cross (from 50 crosses) are planted in four 6 inch pots, the plants are then inoculated with several crown rust strains, the susceptible plants are discarded. The idea is the skew the population for desired characteristics before they reach yield plots. A single seed from each plant is harvested; about 1600 are selected based on hull color or naked groats and are planted one to a pot in the spring greenhouse. The seeds from these single plants are planted in a 5-foot by 5-foot yield plot about the first of May. It is possible to have yield plots 2 years after the initial cross is made using the single seed descent method. However, you don't want to put all your eggs in one basket, so a combination of the bulk and single seed descent methods seems to work well. For every oat variety released, there are approximately 40,000 non-segregating lines are evaluated.

2001 ALFALFA PRODUCTION

Vance Owens and Eva Omdahl

Plant Science 0120

Alfalfa cultivars are tested at several South Dakota research stations. Our objective is to provide producers with yield data from currently available alfalfa cultivars to aid them in cultivar selection. Even though our yield trial does not contain all available cultivars, it should be a helpful tool in identifying cultivars suitable for your specific needs. Table 1 provides forage production data for 26 alfalfa cultivars that are currently on the market. Tons of dry matter yield are shown for four individual cuttings in 2001, total production in 2000, and a cumulative total for 2000-01. Cultivars are ranked from highest to lowest based on the 2-year total. The least significant difference (LSD) listed at the bottom of the table is used to identify significant differences between the cultivars. If the difference in yield between two cultivars exceeds the given LSD, then they are significantly different.

The alfalfa cultivar yield trial was established in April, 2000. Six replications of each cultivar were planted at 15 lbs pure live seed/acre. Fifty pounds of super phosphate (P_2O_5) was applied before planting. Later fertilizer application was made when necessary as recommended by the South Dakota State Soil Testing Laboratory.

Plots were harvested twice in the establishment year and four times in 2001. Forage was harvested with a sickle-type harvestor equipped with a weigh bin for obtaining fresh plot weights. Random subsamples from the fresh herbage were taken to determine percent dry matter. Alfalfa cultivars were evaluated for maturity prior to harvest. Yield differences among cultivars were tested using the LSD at the 0.05 level of probability when significant F-tests were detected by analysis of variance (Table 1).

Forage production was very good in 2001, and adequate moisture allowed us to take four cuttings. This trial will be continued in 2002.

Table 1. Forage yield of 15 alfalfa cultivars entered in the South Dakota State University alfalfa-testing program. Trial is located at the Southeast Research Station near Beresford, SD.

Entry	2001					2000	00-01
	29 May	11 July	7 Aug.	25 Sep.	Total	Total	Total
	Tons Dry Matter/Acre						
Excel	1.89	2.78	1.17	1.22	7.06	3.57	10.63
Garst 6420	1.86	2.77	1.05	1.07	6.75	3.79	10.54
Goldrush 747	1.74	2.82	1.03	1.03	6.61	3.78	10.39
Husky Supreme	1.75	2.75	0.96	1.07	6.53	3.77	10.30
GH 750	1.79	2.77	1.05	0.99	6.59	3.69	10.29
Shaw	1.69	2.66	0.97	1.03	6.36	3.88	10.25
645-II	1.77	2.63	0.94	0.89	6.24	3.85	10.09
Frontier 2000	1.57	2.65	1.02	1.10	6.36	3.61	9.97
Garst 6410	1.84	2.54	0.92	0.83	6.13	3.59	9.71
Multiplier 3	1.65	2.53	1.05	0.96	6.19	3.39	9.58
Pioneer Brand 53H81	1.68	2.59	0.90	0.89	6.06	3.48	9.53
Pioneer Brand 53V08	1.88	2.52	0.92	0.77	6.08	3.30	9.38
Vernal	1.87	2.44	0.91	0.70	5.91	3.35	9.26
Maverick	1.71	2.33	0.86	0.81	5.70	3.43	9.13
Legend Gold	1.81	2.41	0.86	0.71	5.79	3.15	8.94
Mean	1.77	2.57	0.97	0.93	6.24	3.54	9.78
Maturity (Kalu & Fick)	3.6	6.0	4.4	2.9			
LSD (P=0.05)	0.43	NS	0.42	0.52	0.88	0.43	1.05
CV (%)	7.9	12.9	13.6	22.0	9.6	10.5	8.6

NS = not significant at 0.05 level of probability

2001 CORN HYBRID, SOYBEAN AND OAT VARIETY PERFORMANCE TRIALS

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Plant Science 0121

This reports the 2001 Southeast Research Farm performance trials for both conventional (non-Roundup-Ready) and Roundup-Ready corn hybrids and soybean varieties conducted by the South Dakota State University Crop Performance Testing (CPT) program. In addition, the oat variety trial was seeded and harvested by L. Hall, Research associate, SDSU Oat Breeding Project.

CORN:

Experimental Procedures

Entries were placed into either an early or late maturity trial according to ratings reported by a given seed company. The break between the early and late test was 110-day for the conventional non-Roundup Ready hybrid trials. The early and late Roundup-Ready corn hybrid trials were combined into a single trial because there were too few entries to justify separate maturity trials. The relative maturity range for this single test was 99 to 110-day.

Each trial consisted of three replicates (plots) of each entry arranged in a randomized complete block design. Each plot included two 20-foot long rows spaced 30-inches apart. A two-row cone drill seeder with a 31-cell cone mounted above a maxi-merge unit for each row was used to seed. Plots were over-seeded 15% and following emergence thinned to a test population of 27,878 plants per acre. Plots were seeded on May 9, 2001 into a Trent silt loam previously cropped to soybeans. A starter fertilizer of 100 pounds/acre of 37-18-00 was applied 2-inches below and to the side (2 x 2) of the seed row. Force insecticide was T-banded at label rates for corn rootworm control.

The experimental procedures described above apply both to the conventional and the Roundup Ready hybrid corn trials with one exception: Weed control in the Roundup Ready trials consisted of two post emergence applications of Roundup Ultra (32 oz/acre). The first when weeds were 2-4 inches tall, followed by a second application when weed growth was again 2-4 inches tall. In non-Roundup Ready test trials, pre-emergence herbicides consisted of pre-emergence Dual applied according to label instructions.

Measurements of Performance

Yield. Yields are an average of three replicates (plots), and are expressed as bushels per acre, adjusted to 15.5% moisture on a dry-matter basis and a bushel weight of 56 pounds.

Moisture Content. Moisture content is expressed as the percentage of moisture in the shelled corn at harvest. Moisture is inversely related to maturity. Because maturity is of prime importance in South Dakota, moisture figures are of considerable importance in the evaluation of the trial entries. Hybrids with satisfactory yields and low harvest moisture values indicating little if any need for additional drying are desirable.

Use of tables. Check for the "least significant difference" (LSD) value at the bottom of each column of data values. If there are no real differences among the values within a given column, then "non-significant" (NS) is noted.

The reported LSD values can be used in two ways. First, the LSD value indicates how much a variable such as yield must differ between two hybrids before there is a real yield difference. For example, in the early conventional test (Table 1), the LSD value of 16 bu/ac can be used to compare the yields of any two hybrids in the early maturity trial. If hybrid A yields 189 bu/ac and hybrid B yields 175 bu/ac their yield difference is 14 bu/ac (189 - 175 = 14). In this case the two hybrids do not differ in yield because their yield difference of 14 bu/ac is less than the reported LSD value of 16 bu/ac. In contrast, if hybrid C yields 172 bu/ac the yield difference between hybrid A and hybrid C would be 17 bu/ac (189 - 172 = 17). In this case the yield difference of 17 bu/ac is more than the reported LSD value of 16 bu/ac and therefore hybrid A would have a significantly higher yield than hybrid C. Similarly, the LSD values for bushel weight, grain moisture, green snap, and stalk lodging below the ear percentages can be used to determine whether any two hybrids differ in regard to these performance factors.

A second use for the LSD value is to identify the top-group for the current year yields, two-year yields, bushel weight, grain moisture at harvest, green snap percentage, and stalk lodging below the ear percentage. For example, in the conventional hybrid early maturity trial (Table 1) the highest current year yield was 189 bu/ac for Wilson/1458. In order to determine whether it is the only top yielding hybrid in this trial use the LSD value of 16 bu/ac at the bottom of the 2001 yield column. In order for hybrids to be in the top-yield group they must yield 173 bu/ac (189 - 16 = 173) or higher. Technically, a yield of 174 bu/ac would be in the top-yield group while a yield of 173 bu/ac would not be in the top-yield group. However, since all yields and LSD values are rounded to the nearest whole number. We can say 173 bu/ac, because of the rounding-off, is the more appropriate minimum value for top-yield hybrids in this early maturity test in 2001. This value is indicated as the minimum top-group value at the bottom of the 2001 yield column. Top-yield hybrids for 2001 are those hybrids that are equal or higher than the minimum top-group value. In addition, the minimum top-group value is indicated for the 2 yr. (2000-01) average unless there were no significant yield differences.

Similarly, the top-group for other performance factors like bushel weight, grain moisture at harvest, green snap percentage, and stalk lodging below the ear percentage can be determined. For example, in the early maturity test (Table 1), the minimum bushel weight value to qualify for the top-group was 60 lbs. Bushel weights of 60 lbs. or higher are in the top-group for bushel weight. Note that yield and bushel weight values needed to qualify for the top-group are reported as a minimum top-group value. In contrast, the grain moisture, green snap, and lodging below the ear percentage values needed to qualify for the top-group are reported as a maximum top-group value. In other words, yield and bushel weight top-group values must exceed a certain value while grain moisture, green snap, and lodging below ear percentages must be equal to or less than certain values to qualify for the top-group depending on the performance factor being considered. In the early maturity test (Table 1), current year yields must equal 173 bu/ac or higher, bushel weight must equal 60 lbs. or higher, grain moisture must be 15% or lower, and stalk lodging below the ear must equal 2% or lower to be in the top-group for these performance factors in Table 1.

RESULTS - CONVENTIONAL HYBRIDS

Trial results for two years (2000-01) and one year (2001) are summarized below:
Note: Green snap percentages were non-significant (NS) in all 2001 hybrid trials.

Early Maturity Trial (Table 1), 76 hybrid entries. The 2-year average was 172 bu/ac, hybrids had to average 176 bu/ac or higher to be in the top-yield group, 7 hybrids qualified for the top-yield group, and hybrids had to differ by 18 bu/ac to be significantly different in yield. The 2001 average was 171 bu/ac, hybrids had to average 173 bu/ac or higher to be in the top-yield group, 34 hybrids qualified for the top-yield group, and hybrids had to differ by 16 bu/ac to be significantly different in yield. In addition, bushel weight had to equal 60 lbs. or higher (64 hybrids), grain moisture had to equal 15% or less (51 hybrids), and stalk lodging below the ear had to equal 2% or less (37 hybrids) to be in the top-group for these factors.

Late Maturity Trial (Table 2), 33 hybrid entries. The 2-year average was 176 bu/ac; but yield difference among the hybrids tested were not significant. Therefore all 11 hybrids tested were in the top-yield group. The 2001 average was 168 bu/ac, hybrids had to average 177 bu/ac or higher to be in the top-yield group, 9 hybrids qualified for the top-yield group, and hybrids had to differ by 15 bu/ac to be significantly different in yield. In addition, bushel weight had to equal 59 lbs. or higher (23 hybrids) and grain moisture had to equal 16% or less (19 hybrids) to be in the top-group for these factors. Stalk lodging was non-significant.

RESULTS - ROUNDUP READY HYBRIDS

Combined Maturity Trial (Table 3), 26 hybrid entries. The two-year average yield was 167 bu/ac; but yield differences among the hybrids were not significant. Therefore, all 6 hybrids are in the top-yield group. The 2001 average was 169 bu/ac, hybrids had to average 175 bu/ac or higher to be in the top-yield group, 12 hybrids qualified for the top-yield group, and hybrids had to differ by 16 bu/ac to be significantly different in yield. In addition, bushel weight had to equal 58 lbs. or higher (15 hybrids), grain moisture had to equal 14% or less (5 hybrids), and stalk lodging below the ear had to equal 3% or less (22 hybrids) to be in the top-group for these factors.

SOYBEAN:

Experimental Procedures

Soybean entries were placed in either a maturity group-I or group-II test trial according to maturity ratings reported by a given seed company. The number of replications, plot size, and seeder used were previously described under the corn experimental procedures. Plots were seeded on May 16, 2001 at 165,000 pure-live-seed to obtain a final population of about 150,000 plants per acre following emergence. Soybean inoculation was accomplished by applying granular Nitragin brand Soybean Soil Implant down the seed tube, according to label, during seeding. Experimental procedures for the conventional or non-Roundup Ready and the Roundup Ready trials were the same except for weed control. Weed control in the Roundup Ready test consisted of an application of Roundup Ultra (32 oz/A) when weeds were 4-5 inches tall followed by the same application again 21 days later. In the non-Roundup Ready test trials, a labeled pre-emergence application of Dual was made. In addition, a labeled post-emergence application of Poast Plus/Basagran was also made.

Measurements of Performance

Yield values (bu/ac) are an average of three replications, adjusted to 13% moisture (dry-matter basis) and a bushel weight of 60 pounds. Yield, least significant difference (LSD), and minimum top-yield values are rounded off to the nearest whole bushel per acre. Protein and oil content values are for the 2000 season. One replication of every variety in each trial was tested using near-infrared-reflectance-spectroscopy (NIRS). Plant Height was measured from the soil surface to the top node of the main stem. Lodging scores are an average of how erect the main stem of all the plants are at maturity. 1 = all plants erect, 2 = slight lodging, 3 = lodging at a 45 degree angle, 4 = severe lodging, and 5 = all plants flat.

Least significant difference (LSD) values can be used to (1) identity the top-yield group in a test and (2) to determine if varieties differ in yield potential. See previous discussion on use of LSD in the corn Measurements of Performance section.

Entries at each location are numerically sorted from highest to lowest yields according to whether they have been tested for a 3-year, 2-year, and 1-year time period. **Entries tested for three years may also have a top-yield group value in the 2yr (1999-00) and 2001 yield columns. Likewise, entries tested for two years may also have a top-yield group value in the 2001 yield column.**

RESULTS - CONVENTIONAL NON-ROUNDUP READY VARIETIES
Note: Yields are three-year (1999-01), two-year (2000-01), or one-year (2001).

Group- I (Table 4): Varieties had to average at least 50 bushels (three-year), 53 bushels (two-year) or 54 bushels per acre (one-year) to be in the top-yield group. The top-yield groups for the three-year, two-year, and one-year data include 3, 7, and 7 entries, respectively.

Group- II (Table 5): Varieties had to average at least 50 bushels (three-year), 54 bushels (two-year), or 57 bushels per acre (one-year) to be in the top-yield group. The top-yield groups for the three-year, two-year, and one-year data include 10, 18, and 14 entries, respectively.

RESULTS - ROUNDUP READY SOYBEAN VARIETIES
Note: Yields are three-year (1999-01), two-year (2000-01), or one-year (2001).

Group- I (Table 6): There were no significant yield differences among the varieties tested for three years. Varieties had to average at least 52 bushels (two-year) or 54 bushels per acre (one-year) to be in the top-yield group. The top-yield groups for the two-year and one-year data include 9 and 17 entries, respectively.

Group- II (Table 7): There were no significant yield differences among the varieties tested for three years. Varieties had to average at least 55 bushels (two-year) or 56 bushels per acre (one-year) to be in the top-yield group. The top-yield groups for the two-year and one-year data include 17 and 35 entries, respectively.

OAT:

<u>Experimental Procedures</u>

Twelve oat varieties and six experimental lines from the South Dakota State University or the University of Minnesota Oat Breeding projects were tested. The results from two locations (Brookings and Beresford) are reported here. These plots were seeded and harvested by L. Hall, Research associate in the SDSU Oat Breeding project.

Each entry (four replicates or plots) was seeded into plots measuring 5 X 20 feet and later cut back to 5 x12 feet at harvest. A cone drill seeder with a spinner directing seed to seven seed tubes spaced on 7-inch seed rows was used to seed all plots. The pure-live-seed for each entry was determined and all plots were seeded at 1.2 million PLS seeds per acre. Plots were seeded on May 18, 2001 into a Trent silt loam previously cropped to soybeans. Weed control consisted of one application of Bronate at 1.0 pint per acre.

<u>Measurements of Performance</u>

Yield (bu/ac) values are adjusted to 13.5% moisture (dry-matter basis) and a bushel weight of 32 pounds.

RESULTS - OAT VARIETIES

In Table 8, the high yield of 152 bu/ac for year 2001 at Beresford was obtained by the experimental SD96024. This was the only entry in the top-yield group at Beresford. At Brookings, Killdeer was the top-yielding in year 2001. Again, this was the only variety in the top-yield group at Brookings. Over the longer term (1999-2001), seven entries were in the top-yield group at Brookings including Don, Ebeltoft, Jerry, Loyal Settler, Troy and Youngs. In addition, the experimental lines SD97525 and SD97264; and the varieties Ebeltoft, Youngs, Troy, Don, Settler, Richard, Killdeer, and Loyal were also in the top-yield group. Note: Although Ebeltoft and Youngs have shown good yields, they consistently rank very low in bushel weight.

Table 1. Early corn hybrid results, 2000-2001, SE Research Farm.
Relative maturity is 110-day or less.

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/a (15.5% mst.) 2-yr	2001	2001 Bu. wt. lb	Grain mst. (%)	Green snap (%)	Lodged below ear (%)
	Entries tested two years						
KRUGER/K-9111	108	194	187	61	16	0	2
KRUGER/K-9013	110	189	178	60	16	0	3
HEINE/H821	110	187	181	60	16	0	2
KRUGER/K-9013+BT	110	186	184	59	16	0	0
KRUGER/K-9010BT/CL	106	182	185	60	16	0	1
DAIRYLAND/STEALTH-1609	109	182	172	61	15	0	1
DAIRYLAND/STEALTH-1507	108	177	179	60	15	0	2
HEINE/H775	109	174	179	60	16	0	0
HEINE/H765	108	167	169	59	15	0	1
DAHLCO/DS 2660	105	166	166	58	14	0	2
WILSON/1364	104	164	162	61	15	0	3
MUSTANG/7105BT	105	163	170	62	15	0	3
WILSON/1475PT	108	158	154	58	15	0	1
HOEGEMEYER/2601	106	158	162	61	15	0	3
KRUGER/K-9011	107	155	156	60	16	0	2
JACOBSEN/JS4341	104	148	158	61	15	0	1
	Entries tested one year						
WILSON/1458	107	.	189	61	15	0	2
SANDS/SOI 9082	108	.	187	61	15	0	1
KALTENBERG/K6396	107	.	187	61	15	0	1
DEKALB/DKC60-08	110	.	187	61	15	0	1
GOLD COUNTRY/X10010BT	110	.	185	60	15	0	1
KAUP/KS 97-109BT	109	.	185	59	15	0	2
SANDS/SOI 9102	110	.	185	59	15	0	1
HEINE/H785	109	.	184	60	16	0	1
KAUP/KS 97-1101	110	.	184	60	15	0	2
CROWS/4908	110	.	184	62	16	0	3
WENSMAN/W 4418	105	.	183	60	15	0	1
HEINE/H780	108	.	183	61	16	0	2
JACOBSEN/JS4583BT	108	.	183	60	15	0	1
JACOBSEN/JS4632	110	.	182	59	15	0	1
MUSTANG/7108BT	108	.	180	60	15	0	1
GARST/N9513	108	.	179	60	15	0	2
JACOBSEN/JS4543	106	.	178	60	16	0	3

Table 1. Early hybrid results (continued).

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/ac (15.5% mst.) 2-yr	2001	2001 Bu. wt. lb	Grain mst. (%)	Green snap (%)	Lodged below ear (%)
	Entries tested one year						
PFISTER/1680	99	.	177	62	15	0	1
JACOBSEN/JS4487	106	.	176	58	15	0	4
JACOBSEN/JS4785BT	110	.	176	60	16	0	2
ASGROW/RX708	110	.	176	61	16	0	0
KALTENBERG/K6789	109	.	176	60	15	0	1
WILSON/1563	110	.	175	61	16	0	3
PFISTER/2656	109	.	175	61	15	0	3
CROWS/3520 B	107	.	175	62	16	0	0
GARST/8590IT	105	.	174	61	15	0	2
KRUGER/K-9211A	107	.	173	60	15	0	2
EPLEY/E2470	110	.	172	60	15	0	1
JACOBSEN/JS4637	110	.	172	60	15	0	3
MIDWEST/G 7706	110	.	172	60	16	0	4
DAHLCO/DS X-0031	103	.	171	60	14	0	1
KRUGER/K-9211BT	107	.	168	61	16	0	0
HEINE/H788	109	.	167	61	15	0	0
DEKALB/DKC57-72	107	.	167	62	18	0	1
GARST/N8577IT	108	.	167	61	16	0	2
WENSMAN/W 4314	102	.	166	58	14	0	0
EPLEY/E2433	108	.	166	60	15	0	0
HEINE/H745	110	.	165	62	15	0	3
HOEGEMEYER/GLL418	109	.	165	59	16	0	1
HOEGEMEYER/HBT619	104	.	165	60	15	0	0
EPLEY/E1579	105	.	165	58	14	0	2
DAIRYLAND/STEALTH-1611	109	.	164	60	16	0	2
WENSMAN/W 4424	107	.	164	60	15	0	2
KAUP/KS 97-108CL	108	.	163	61	15	0	1
DEKALB/DKC60-15	110	.	162	61	17	0	2
PFISTER/2024	101	.	161	62	15	0	2
KAYSTAR/KX-665	105	.	161	62	15	0	1
KRUGER/K-9012BT	109	.	161	61	18	0	1
WENSMAN/W 4388	105	.	161	60	15	0	0
JACOBSEN/JS4345	106	.	161	62	16	0	2
DAIRYLAND/STEALTH-1607	105	.	160	60	15	0	1

Table 1. Early hybrid results (continued).

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/ac (15.5% mst.) 2-yr	2001	2001 Bu. wt. lb	Grain mst. (%)	Green snap (%)	Lodged below ear (%)
	Entries tested one year						
EPLEY/E1493	103	.	160	61	15	0	4
GOLD COUNTRY/X10008	106	.	159	60	15	0	2
MUSTANG/5151	100	.	159	61	15	0	1
KRUGER/K-9210	106	.	156	60	16	0	1
SANDS/SOI 9041	104	.	156	61	15	0	3
WENSMAN/W 4284	100	.	152	61	15	0	0
MUSTANG/7710	110	.	151	60	15	0	1
WENSMAN/W 4362	104	.	150	58	14	0	2
DAHLCO/DS X-0012	100	.	149	60	14	0	2
Test average:		172	171	60	15	0	2
LSD (5%) values:		18	16	2	1	NS	2
Top-group values*- Minimum:		176	173	60			
Maximum:					15	0	2
No. entries in top group:		7	34	64	51	76	37
Coef. of variation#:		5	6				

* Top group value- within one LSD value of the highest yield or bushel weight values or the lowest grain moisture, green snap or lodging percentage values.
NS indicates values within a column are not significantly different.
Measure of experimental error: values less than 15% are desired.

Table 2. Late corn hybrid results, 2000-2001, SE Research Farm.
Relative maturity is 111-day or more.

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/a (15.5% mst.) 2-yr	Yield - bu/a (15.5% mst.) 2001	2001 Bu. wt. lb	2001 Grain mst. (%)	2001 Green snap (%)	2001 Lodged below ear (%)
	Entries tested two years						
KRUGER/K-9014BT	111	189	179	60	18	0	3
ASGROW/RX730YG	111	185	188	60	16	0	1
EPLEY/E3610BT	111	185	182	58	16	0	0
HEINE/H840	112	180	174	58	15	0	3
HOEGEMEYER/2666	113	178	169	60	16	0	2
KRUGER/K-9114	112	176	164	59	16	0	4
HOEGEMEYER/2649	111	173	169	58	15	0	1
HEINE/H825	111	171	170	59	16	0	0
EPLEY/E3620	113	170	175	59	16	0	4
GARST/8464IT	111	165	142	60	18	0	2
JACOBSEN/JS56	112	164	168	60	16	0	2
	Entries tested one year						
DEKALB/DKC63-03	113	.	192	61	17	0	2
KALTENBERG/K7337	113	.	192	59	16	0	1
KAYSTAR/KX-898	114	.	187	59	18	0	3
KRUGER/K-9014+BT	111	.	181	59	17	0	3
EPLEY/E3630BT	113	.	178	60	17	0	1
HEINE/H860	114	.	177	59	16	0	1
HEINE/H831	112	.	174	60	17	0	2
US SEEDS/US C1111	111	.	171	58	15	0	1
GARST/8301	114	.	170	59	18	0	0
KRUGER/EX-214-1	111	.	169	56	15	0	3
WILSON/1752	112	.	169	58	17	0	2
KRUGER/K-9114BT	111	.	168	59	17	0	1
NC+/4771	111	.	166	59	15	0	2
HEINE/H844	114	.	163	58	16	0	4
EPLEY/E3223	112	.	162	59	15	0	3
NC+/5169	112	.	161	61	17	0	3
KALTENBERG/K7202CL	112	.	156	58	15	0	1
GARST/8327IT	113	.	155	60	19	0	1
HEINE/H857	114	.	154	59	18	0	2
HOEGEMEYER/CK044	111	.	147	57	15	0	2
HEINE/H848	113	.	145	58	16	0	1
WILSON/1671CL	111	.	140	59	18	0	3

Table 2. Late corn hybrid results continued.

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/a (15.5% mst.) 2-yr	2001	2001 Bu. wt. lb	Grain mst. (%)	Green snap (%)	Lodged below ear (%)
Test average:		176	168	59	16	0	2
LSD (5%) values:		NS	15	2	1	NS	NS
Top-group values*- Minimum:		164	177	59			
Maximum:					16	0	4
No. entries in top group:		11	9	23	19	33	33
Coef. of variation#:		6	5				

* Top group value- within one LSD value of the highest yield or bushel weight values or the lowest grain moisture, green snap or lodging percentage values.
NS indicates values within a column are not significantly different.
Measure of experimental error: values less than 15% are desired.

Table 3. Roundup Ready combined early-late corn hybrid results, 2000-2001, SE Research Farm. Relative maturity is 99 to 110-day.

Brand / Hybrid	Seed Company Relative Maturity	Yield - bu/ac (15.5% mst.) 2-yr	Yield - bu/ac (15.5% mst.) 2001	2001 Bu. wt. lb	2001 Grain mst. (%)	2001 Green snap (%)	2001 Lodged below ear (%)
	Entries tested two years						
SEEDS 2000/EX3191RR	109	179	168	58	15	0	4
JACOBSEN/J4753RR	110	176	191	58	16	0	2
ASGROW/RX601RR/YG	105	173	181	60	16	0	3
US SEEDS/US C1091RR	109	163	165	58	15	0	3
JACOBSEN/J4655RR	108	160	152	58	15	0	1
MUSTANG/6005RR	105	153	136	58	16	0	1
	Entries tested one year						
TRIUMPH/1120BTRR	108	.	190	59	15	0	1
KRUGER/EX-212RR	108	.	186	59	15	0	5
KRUGER/K-9912+RR	110	.	184	60	16	0	5
KAYSTAR/X1131R	110	.	183	59	16	0	6
PFISTER/2656 RR	109	.	182	59	15	0	6
CHANNEL/7707R	110	.	179	59	16	0	2
DEKALB/DKC60-17	110	.	178	60	16	0	3
HEINE/H8490	110	.	178	60	16	0	2
ASGROW/RX730RR/YG	110	.	176	59	16	0	3
DEKALB/DKC57-40	107	.	175	60	15	0	1
KRUGER/K-9910RR	106	.	169	58	15	0	4
MUSTANG/7909RRBT	109	.	166	58	18	0	2
KRUGER/K-9208RR	105	.	165	60	14	0	3
DAHLCO/DS X-1001RR	100	.	163	59	14	0	3
DAHLCO/DS X-0105RR	105	.	163	59	14	0	2
HEINE/H8380	110	.	157	56	16	0	1
HEINE/H8250	110	.	155	59	16	0	3
PFISTER/1554 RR	99	.	150	57	13	0	1
GOLD COUNTRY/X10011RR	110	.	147	57	14	0	1
FONTANELLE/HC7735BT/RR	110	.	144	58	17	0	1
Test average:		167	169	59	15	0	3
LSD (5%) values:		NS	16	2	1	NS	3
Top-group values*- Minimum:		153	175	58			
Maximum:					14	0	4
No. entries in top group:		6	12	15	5	26	22
Coef. of variation#:		9	6				

* Top group value- within one LSD value of the highest yield or bushel weight values or the lowest grain moisture, green snap or lodging percentage values.
NS indicates values within a column are not significantly different.
\# Measure of experimental error: values less than 15% are desired.

Table 4. Maturity group-I soybean test results, 1999-2001, seeded May 16.

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
	Entries tested three years							
SANDS/SOI 169	56	57	57	33.8	17.8	37	1	132
LATHAM/392 Brand	55	55	53	34.3	17.7	37	1	130
SANDS/SOI 222	54	53	53	34.4	16.8	34	1	128
PUBLIC/STURDY,II-CK*	47	50	47	33.8	18.4	39	2	122
PUBLIC/PARKER,I-CK*	47	49	48	33.8	18.4	41	3	123
PUBLIC/SURGE,0-CK*	46	48	46	34.6	18.7	35	1	118
PUBLIC/BELL-SCN	43	46	44	35.5	17.7	38	1	122
PUBLIC/STRIDE	40	43	46	32.8	18.6	34	1	120
	Entries tested two years							
KRUGER/K-1919	.	59	56	34.0	18.2	35	1	125
KRUGER/K-1991	.	58	57	34.5	18.3	33	1	125
THOMPSON/T-3201	.	55	52	33.1	18.4	33	1	127
LATHAM/EX-290	.	55	53	33.7	18.7	36	1	122
	Entries tested one year							
PRAIRIE BR./PB172	.	.	59	.	.	37	1	127
KRUGER/K-1909	.	.	58	.	.	39	1	131
THOMPSON/T-3182	.	.	54	.	.	41	1	123
KRUGER/K-1818	.	.	54	.	.	34	1	128
PRAIRIE BR./PB171	.	.	53	.	.	33	1	125
PUBLIC/SD96-460K(D)	.	.	53	.	.	39	1	127
THOMPSON/EX3211	.	.	53	.	.	35	2	126
JACOBSEN/J750	.	.	52	.	.	37	1	132
PUBLIC/SD96-111(L)	.	.	52	.	.	40	1	123
PUBLIC/SD96-460K(L)	.	.	51	.	.	38	2	128
PUBLIC/SD96-111(D)	.	.	50	.	.	40	1	123
KRUGER/K-2343A	.	.	50	.	.	35	2	128
KRUGER/K-1809	.	.	48	.	.	35	2	128
Test average:	49	52	52	34.0	18.1	37	1	.
LSD(5%) value ($):	6	6	5					
Min.top-yield value ($):	50	53	54					
Coef. of variation (#):	9	6	5					

* Ck/SCN = maturity check / soybean cyst nematode resistant, respectively.
$/+ See yield / protein & oil sections, respectively.
~ Lodging: 1= all plants erect, 3= some at 45 degrees, 5= all plants flat.
NS values within a column are not significant.
\# Measure of experimental error: values of < 15% are desired.

Table 5. Maturity group-II soybean test results, 1999-2001, seeded May 16.

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	------- 2001 ------- Ht. in.	Ldg. Sc.~	Maturity: Days after seeding
	Entries tested three years							
MUSTANG/M-2218	56	58	60	33.2	17.7	33	1	129
STINE/2490-1	56	58	57	33.7	18.2	34	1	131
KAUP KS/2474	55	59	58	33.6	18.0	40	2	132
KRUGER/K-2425	55	56	56	34.5	17.0	33	2	131
PRAIRIE BR./PB202	54	58	57	34.0	17.7	35	1	131
THOMPSON/T-3222	54	55	52	33.1	17.9	36	1	127
PRAIRIE BR./PB218	53	59	59	33.7	18.0	34	1	123
PRAIRIE BR./PB217	52	54	52	33.4	17.9	35	1	130
MUSTANG/M-2251	51	54	55	32.4	19.0	36	2	131
PRAIRIE BR./PB237-1	50	55	56	34.1	17.4	35	1	131
PUBLIC/SD96-170	47	54	54	33.3	17.7	41	3	131
PUBLIC/STURDY,II-CK*	45	48	47	34.0	18.4	40	2	123
PUBLIC/PARKER,I-CK*	45	47	51	33.1	18.9	43	3	123
PUBLIC/IA2021	44	45	45	32.2	19.2	33	2	127
COYOTE/9525	43	51	54	32.2	18.7	44	2	130
PUBLIC/TURNER-SCN	43	49	47	33.1	18.4	41	2	130
PUBLIC/JACK,III-CK*	40	46	47	34.5	17.7	47	3	.
	Entries tested two years							
PRAIRIE BR./PB230	.	58	58	32.5	18.4	35	1	131
SANDS/SOI 280	.	57	56	34.2	17.5	35	2	132
ASGROW/A2553	.	56	56	32.5	18.9	35	2	129
THOMPSON/T-3244	.	56	54	33.5	17.9	35	2	130
PRAIRIE BR./PB256	.	56	54	33.7	18.1	35	2	130
THOMPSON/T-3231	.	56	55	33.1	18.2	38	1	134
MUSTANG/M-2252	.	56	56	34.6	16.4	35	2	132
SANDS/SOI 236	.	56	58	33.4	18.4	39	2	130
	Entries tested one year							
SANDS/SOI 288	.	.	62	.	.	36	2	134
PRAIRIE BR./PB278	.	.	58	.	.	36	2	.
US SEEDS/US S271	.	.	57	.	.	36	2	132
KRUGER/K-2929	.	.	57	.	.	36	1	.
KRUGER/K-2424	.	.	57	.	.	36	2	131
KRUGER/K-2313	.	.	57	.	.	36	1	131
JACOBSEN/J EXP 826	.	.	57	.	.	35	2	.
ASGROW/A2824	.	.	55	.	.	35	1	.
GOLD COUNTRY/X2125	.	.	55	.	.	34	1	130

Table 5. Maturity group-II test results (continued).

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
			Entries tested one year					
LATHAM/690 Brand	.	.	55	.	.	35	2	130
KRUGER/K-2717	.	.	54	.	.	34	1	130
LATHAM/EX-940	.	.	53	.	.	36	2	.
COYOTE/EX723	.	.	53	.	.	34	1	129
PRAIRIE BR./PB241	.	.	53	.	.	36	1	130
SANDS/SOI 240	.	.	51	.	.	31	1	130
COYOTE/9123	.	.	51	.	.	39	2	124
LATHAM/530 Brand	.	.	50	.	.	37	1	129
JACOBSEN/J815	.	.	49	.	.	36	2	134
Test average:	49	54	54	33.4	18.1	36	2	130
LSD(5%) value ($):	6	5	5					
Min.top-yield value ($):	50	54	57					
Coef. of variation (#):	9	7	5					

* Ck/SCN = maturity check / soybean cyst nematode resistant, respectively.
$/+ See yield / protein & oil sections, respectively.
~ Lodging: 1= all plants erect, 3= some at 45 degrees, 5= all plants flat.
NS values within a column are not significant.
\# Measure of experimental error: values of < 15% are desired.

Table 6. Maturity group-I Roundup Ready soybean test results, 1999-2001, seeded May 16.

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
	Entries tested three years							
KRUGER/K-232-1RR	56	55	55	33.2	18.2	42	2	132
PROFISEED/PS 4206RR	55	56	57	33.3	17.7	42	2	133
MUSTANG/M-199RR	51	54	55	34.4	18.0	38	1	129
	Entries tested two years							
KRUGER/K-199+RR	.	56	56	33.3	18.2	37	2	132
ZILLER/BT 7191R	.	56	55	33.9	18.6	37	1	132
TOP FARM/E1971RR	.	56	55	33.4	18.8	39	2	130
KRUGER/K-211ARR	.	56	55	33.1	18.1	38	2	133
KRUGER/K-222RR	.	55	56	33.8	18.3	36	1	131
KRUGER/K-221+RR	.	55	53	33.4	17.9	39	2	132
KRUGER/K-166RR	.	51	52	31.6	18.6	43	2	123
SANDS/SOI 1800RR	.	51	51	32.6	18.7	37	1	126
DEKALB/DKB19-51	.	51	50	32.2	18.8	36	1	127
DEN BESTEN/DB1601RR	.	50	53	33.5	18.4	38	1	128
PUBLIC/SD99-051R	.	48	49	32.5	19.0	45	2	130
PUBLIC/SD99-048R	.	44	42	34.5	18.5	43	2	127
	Entries tested one year							
THOMPSON/T-3205RR	.	.	59	.	.	33	1	133
KRUGER/K-212-2RR	.	.	58	.	.	34	1	132
PRAIRIE BRAND/PB1981RR	.	.	57	.	.	38	2	130
DEN BESTEN/DB1902RR	.	.	56	.	.	35	1	133
LATHAM/EX-417RR	.	.	56	.	.	40	2	130
THOMPSON/T-3217RR	.	.	56	.	.	39	2	130
PROFISEED/PS 4212RR	.	.	56	.	.	40	1	131
DEN BESTEN/DB1502RR	.	.	56	.	.	38	1	123
JACOBSEN/J702RR	.	.	55	.	.	39	1	129
RENK/RS199RR	.	.	54	.	.	36	2	124
DEN BESTEN/DB1802RR	.	.	54	.	.	37	1	125
THOMPSON/T-3225RR	.	.	54	.	.	38	1	129
SANDS/SOI 174RR	.	.	54	.	.	44	2	125
PROFISEED/PS 4192RR	.	.	54	.	.	32	2	131
PRAIRIE BRAND/PB1821RR	.	.	53	.	.	38	1	128
KRUGER/K-212RR	.	.	53	.	.	40	2	130
PRAIRIE BRAND/PB1941RR	.	.	53	.	.	31	1	132
KRUGER/K-221RR	.	.	53	.	.	37	1	130

Table 6. Maturity group-I Roundup Ready test results (continued).

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
				Entries tested one year				
TOP FARM/E1701RR	.	.	53	.	.	36	1	129
KRUGER/K-161RR	.	.	52	.	.	35	1	127
JACOBSEN/J792RR	.	.	51	.	.	42	2	133
KRUGER/K-202-1RR	.	.	50	.	.	36	1	130
ASGROW/AG1602	.	.	50	.	.	37	2	121
TOP FARM/E1901RR	.	.	50	.	.	35	2	130
RENK/RS159RR	.	.	49	.	.	40	1	123
KRUGER/K-202-2RR	.	.	49	.	.	37	2	127
DEN BESTEN/DB1301RR	.	.	49	.	.	34	1	118
PUBLIC/SD99-026R	.	.	48	.	.	41	2	124
KRUGER/K-181RR	.	.	47	.	.	37	2	130
PUBLIC/SD99-065R	.	.	46	.	.	41	1	124
KRUGER/K-151-1RR	.	.	46	.	.	35	1	126
PUBLIC/SD99-059R	.	.	45	.	.	41	1	129
PUBLIC/SD99-024R	.	.	45	.	.	36	1	128
MIDWEST SEED/GR1931	.	.	44	.	.	44	2	125
PUBLIC/SD99-022R	.	.	44	.	.	45	2	126
HY-VIGOR/2063RR	.	.	43	.	.	38	1	126
Test average:	54	53	52	33.2	18.4	38	1	128
LSD(5%) value ($):	NS	4	5					
Min.top-yield value ($):	51	52	54					
Coef. of variation (#):	9	6	6					

* Ck/SCN = maturity check / soybean cyst nematode resistant, respectively.
$/+ See yield / protein and oil sections, respectively.
~ Lodging: 1= all plants erect, 3= some at 45 degrees, 5= all plants flat.
NS values within a column are not significant.
\# Measure of experimental error: values of < 15% are desired.

Table 7. Maturity group-II Roundup Ready soybean test results, 1999-2001, seeded May 16.

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
	Entries tested three years							
KRUGER/K-250RR	56	57	54	34.0	17.7	39	2	.
MUSTANG/M-222RR	55	57	57	34.1	17.3	42	2	.
PRAIRIE BRAND/PB2397RR	55	55	55	33.8	18.2	41	2	.
KAUP/KS 237R	54	55	53	34.1	17.6	41	2	132
PRAIRIE BRAND/PB2297RR	54	55	55	33.5	17.6	39	2	.
DEN BESTEN/DB2200RR	52	54	53	34.0	17.4	41	2	129
HOEGEMEYER/241RR	51	53	53	34.0	17.7	37	1	130
GREAT LAKES/GL2300RR	49	53	54	34.5	17.6	39	2	129
HOEGEMEYER/230RR	49	52	49	33.1	17.9	45	3	.
DEN BESTEN/DB2899RR	48	51	51	33.4	18.1	38	2	.
US SEEDS/US S2709RR	43	53	50	33.4	18.4	45	3	.
MUSTANG/M-271RR	42	52	51	34.1	18.2	43	3	.
	Entries tested two years							
DEN BESTEN/DB2601RR	.	59	61	33.5	17.7	38	2	.
PRAIRIE BRAND/PB2117RR	.	58	58	33.9	17.8	38	2	131
KRUGER/K-269RR	.	58	57	33.9	17.8	41	2	130
PRAIRIE BRAND/PB2730RR	.	58	57	33.5	18.0	39	2	.
SANDS/SOI 271RR	.	57	55	33.5	17.7	38	2	.
MUSTANG/M-272RR	.	57	54	33.5	17.6	39	2	.
ASGROW/AG2703	.	56	50	33.3	18.4	38	1	132
DEKALB/DKB28-51	.	55	55	33.7	17.1	39	2	.
SANDS/SOI 226RR	.	55	55	33.8	17.8	41	2	132
KRUGER/K-279RR	.	55	54	33.1	17.8	37	2	.
DEKALB/DKB23-51	.	55	52	34.2	17.8	37	1	128
DEKALB/DKB26-52	.	55	55	33.6	18.5	42	3	134
HY-VIGOR/266RR	.	54	54	34.3	17.1	38	2	132
GOLDEN HARVEST/H2304RR	.	54	53	34.0	18.2	40	2	132
KRUGER/K-252+RR	.	54	54	34.5	17.8	35	3	.
ASGROW/AG2302	.	53	54	32.6	19.0	41	1	126
PRAIRIE BRAND/PB2717RR	.	53	53	34.6	17.9	45	3	.
DYNA-GRO/3232RR	.	53	53	33.8	18.3	40	2	133
DAIRYLAND/DSR-228/RR	.	52	49	34.6	18.1	39	1	129
KALTENBERG/KB261RR	.	51	53	33.6	18.5	44	3	.
GOLDEN HARVEST/H2888RR	.	51	50	34.5	17.6	40	3	.
SANDS/SOI 2526RR	.	51	49	32.2	18.9	43	3	.

Table 7. Maturity group-II Roundup Ready test results (continued).

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
			Entries tested two years					
MUSTANG/M-242RR	.	50	50	35.5	16.3	36	1	.
COYOTE/9626RR	.	50	49	34.8	17.0	38	2	134
ZILLER/BT 7211R	.	50	51	34.4	18.4	37	1	127
PUBLIC/SD99-099R	.	49	46	33.2	18.4	41	2	124
PUBLIC/SD99-107R	.	48	45	34.1	18.4	43	2	131
			Entries tested one year					
LATHAM/EX-397RR	.	.	62	.	.	35	1	132
PRAIRIE BRAND/PB2841RR	.	.	61	.	.	37	1	.
KRUGER/K-252-3RR	.	.	60	.	.	39	1	.
KRUGER/K-252-2RR	.	.	58	.	.	37	2	134
LATHAM/EX-927RR	.	.	58	.	.	38	1	.
KALTENBERG/KB250NRR	.	.	58	.	.	39	1	131
KAUP/KS 284R	.	.	58	.	.	35	1	.
TOP FARM/E2431RR	.	.	58	.	.	37	1	.
SANDS/SOI 2601RR	.	.	58	.	.	39	2	.
KRUGER/K-253-3RR	.	.	58	.	.	33	1	134
PRAIRIE BRAND/PB2141RR	.	.	58	.	.	34	1	131
DEN BESTEN/DB2402RR	.	.	58	.	.	35	1	132
DYNA-GRO/3278RR	.	.	57	.	.	38	2	.
LATHAM/EX-427RR	.	.	57	.	.	40	1	.
PIONEER/93B01	.	.	57	.	.	37	2	.
KRUGER/K-283RR	.	.	57	.	.	43	2	.
PRAIRIE BRAND/PB2421RR	.	.	57	.	.	35	2	133
MUSTANG/M-201RR	.	.	57	.	.	34	1	130
LATHAM/757RR	.	.	57	.	.	37	2	.
LATHAM/EX-867RR	.	.	56	.	.	43	3	133
ASGROW/AG2905	.	.	56	.	.	36	2	.
TOP FARM/E3211RR	.	.	56	.	.	34	1	132
PRAIRIE BRAND/PB2131RR	.	.	56	.	.	41	2	130
STINE/2136-4	.	.	56	.	.	38	2	133
GREAT LAKES/XP1527RR	.	.	56	.	.	38	1	.
THOMPSON/T-3275RR	.	.	56	.	.	38	2	133
KRUGER/K-262-2RR	.	.	56	.	.	41	2	132
PROFISEED/PS 4262RR	.	.	56	.	.	40	2	.
LATHAM/EX-657RR	.	.	56	.	.	35	1	.
DEN BESTEN/DB2703RR	.	.	56	.	.	37	1	133

Table 7. Maturity group-II Roundup Ready test results (continued).

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
			Entries tested one year					
MUSTANG/M-211RR	.	.	55	.	.	41	2	129
PROFISEED/PS 4242RR	.	.	55	.	.	34	1	.
DYNA-GRO/3213RR	.	.	55	.	.	41	2	130
DAIRYLAND/DSR-221/RR	.	.	55	.	.	35	1	128
KRUGER/K-255-5RR	.	.	55	.	.	36	2	.
PRAIRIE BRAND/PB2861RR	.	.	55	.	.	42	3	.
PRAIRIE BRAND/PB2431RR	.	.	55	.	.	37	1	.
LATHAM/EX-647RR	.	.	55	.	.	37	2	132
LATHAM/EX-787RR	.	.	54	.	.	41	2	133
MUSTANG/M-280RR	.	.	54	.	.	36	1	.
TOP FARM/E2401RR	.	.	54	.	.	36	1	134
PRAIRIE BRAND/PB2261RR	.	.	54	.	.	40	2	134
TOP FARM/E3231RR	.	.	54	.	.	34	2	131
DAIRYLAND/DST2129/RR	.	.	54	.	.	38	1	126
HOEGEMEYER/270RR	.	.	54	.	.	43	2	.
PROFISEED/PS 4211RR	.	.	54	.	.	38	2	128
KRUGER/K-221-1RR	.	.	54	.	.	38	1	130
KAUP/KS 244R	.	.	54	.	.	37	1	131
KAUP/KS 267R	.	.	54	.	.	39	2	.
NORTHSTAR/NS 2406RR	.	.	54	.	.	37	1	131
SANDS/SOI 2401RR	.	.	54	.	.	36	1	.
DEN BESTEN/DB2301RR	.	.	53	.	.	39	2	132
MUSTANG/M-241RR	.	.	53	.	.	37	1	130
PROFISEED/PS 4240RR	.	.	53	.	.	37	2	.
GOLD COUNTRY/EXP-328RR	.	.	53	.	.	41	2	.
KRUGER/K-272-2RR	.	.	53	.	.	35	2	.
KRUGER/K-282-2RR	.	.	53	.	.	37	1	.
GREAT LAKES/GL2515RR	.	.	53	.	.	40	1	132
DEN BESTEN/DB2102RR	.	.	53	.	.	39	2	130
THOMPSON/T-3245RR	.	.	53	.	.	34	1	133
MALLARD/RR2312	.	.	53	.	.	36	1	130
SANDS/SOI 2959RR	.	.	53	.	.	39	3	.
SANDS/SOI 2792RR	.	.	53	.	.	42	2	.
MALLARD/RRX2111	.	.	53	.	.	39	1	131
RENK/RS231RR	.	.	53	.	.	40	1	.

Table 7. Maturity group-II Roundup Ready test results (continued).

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
			Entries tested one year					
HY-VIGOR/2431RR	.	.	53	.	.	36	1	
KRUGER/K-255RR	.	.	53	.	.	40	2	.
GREAT LAKES/GL2200RR	.	.	53	.	.	37	1	128
MUSTANG/M-261RR	.	.	53	.	.	39	3	.
PRAIRIE BRAND/PB2481RR	.	.	52	.	.	35	1	134
KRUGER/K-272RR	.	.	52	.	.	38	1	.
ASGROW/AG2402	.	.	52	.	.	39	2	.
GREAT LAKES/GL2419RR	.	.	52	.	.	35	1	.
CROWS/C2606R	.	.	52	.	.	42	2	.
KRUGER/K-250-1RR	.	.	52	.	.	35	1	133
RENK/RS240RR	.	.	52	.	.	38	1	127
MIDWEST SEED/GR2132	.	.	52	.	.	37	1	128
KRUGER/K-240RR	.	.	52	.	.	36	1	133
MIDWEST SEED/GR2485	.	.	52	.	.	40	2	133
GREAT LAKES/GL2704RR	.	.	51	.	.	40	3	.
KRUGER/K-288-8RR	.	.	51	.	.	39	2	.
KAUP/KS 255R	.	.	51	.	.	40	2	133
KRUGER/K-286RR	.	.	51	.	.	40	2	.
HOEGEMEYER/2222RR	.	.	51	.	.	40	1	133
PRAIRIE BRAND/PB2441RR	.	.	51	.	.	35	1	132
PRAIRIE BRAND/PB2821RR	.	.	51	.	.	41	3	.
MIDWEST SEED/GR2626	.	.	51	.	.	40	3	133
SANDS/SOI 2459RR	.	.	51	.	.	35	1	.
PUBLIC/S993-1233L	.	.	51	.	.	42	3	.
PRAIRIE BRAND/PB2541RR	.	.	50	.	.	39	2	.
MIDWEST SEED/GR2631	.	.	50	.	.	37	1	.
MUSTANG/M-223NRR	.	.	50	.	.	36	2	133
KRUGER/K-254RR	.	.	50	.	.	37	2	133
LATHAM/EX-917RR	.	.	50	.	.	40	2	.
JACOBSEN/J816RR	.	.	50	.	.	39	2	132
COYOTE/9425RR	.	.	50	.	.	39	2	132
SANDS/SOI 2802RR	.	.	50	.	.	41	2	134
KRUGER/K-280RR	.	.	50	.	.	35	2	.
DYNA-GRO/3263RR	.	.	50	.	.	40	2	133
HY-VIGOR/299XRR	.	.	50	.	.	40	2	.
DEN BESTEN/DBX201RR	.	.	50	.	.	37	2	131

Table 7. Maturity group-II Roundup Ready test results (continued).

Brand / Entry*	Yield - bu/ac (13% moisture) 3yr	2yr	2001	2000 Prot. (%)+	2000 Oil (%)+	2001 Ht. in.	2001 Ldg. Sc.~	2001 Maturity: Days after seeding
			Entries tested one year					
JACOBSEN/J897RR	.	.	49	.	.	41	3	.
MUSTANG/M-230RR	.	.	49	.	.	37	2	132
NORTHSTAR/NS 2004RR	.	.	49	.	.	40	1	127
PRAIRIE BRAND/PB2621RR	.	.	49	.	.	35	2	.
DEN BESTEN/DBX231RR	.	.	49	.	.	37	2	131
PROFISEED/PS X425RR	.	.	49	.	.	40	2	133
NORTHSTAR/NS 2255RR	.	.	48	.	.	42	2	.
PRAIRIE BRAND/PB2633RR	.	.	48	.	.	41	2	.
STINE/2103-4	.	.	48	.	.	34	1	133
THOMPSON/EX0816RR	.	.	48	.	.	36	2	132

PUBLIC/SD99-100R	.	.	47	.	.	40	3	127
LATHAM/EX-747RRN	.	.	47	.	.	35	1	133
PRAIRIE BRAND/PB2181RR	.	.	46	.	.	36	2	134
CROWS/C24009RN	.	.	46	.	.	39	2	127
PUBLIC/SD99-104R	.	.	46	.	.	42	1	130
PIONEER/92B36	.	.	46	.	.	37	1	134
US SEEDS/US S2602RR	.	.	46	.	.	37	1	.
HY-VIGOR/216RR	.	.	45	.	.	39	1	129
PUBLIC/SD99-109R	.	.	44	.	.	40	1	131
PUBLIC/SD99-096R	.	.	44	.	.	48	3	132
PUBLIC/SD99-028R	.	.	43	.	.	43	3	133
PUBLIC/SD99-087R	.	.	43	.	.	43	2	.
PUBLIC/SD93-828E	.	.	43	.	.	40	2	127
PUBLIC/SD99-083R	.	.	42	.	.	35	1	125
PUBLIC/SD99-097R	.	.	41	.	.	44	3	131
Test average:	51	54	52	33.9	17.9	39	2	131
LSD(5%) value ($):	NS	4	6					
Min.top-yield value ($):	42	55	56					
Coef. of variation (#):	10	8	7					

* Ck/SCN = maturity check / soybean cyst nematode resistant, respectively.
$/+ See yield / protein and oil sections, respectively.
~ Lodging: 1= all plants erect, 3= some at 45 degrees, 5= all plants flat.
NS values within a column are not significant.
Measure of experimental error: values of < 15% are desired.

Table 8. Oat variety testing yield averages at two locations.

Variety	Brookings 2001	Brookings 3-yr	Beresford 2001	Beresford 3-yr
	-----------	bu/acre	-----------	
Don	111	108+	139	.
Ebeltoft	100	111+	133	.
Hytest	98	89	104	.
Jerry	131	117+	130	.
Killdeer	146+	.	130	.
Loyal	134	121+	130	.
Paul Hls	53	64	70	.
Richard	97	99	129	.
Riser	83	88	116	.
Settler	126	114+	132	.
Troy	124	114+	126	.
Youngs	129	122+	128	.
Experimental lines:				
SD96024	133	.	152+	.
SD97039	126	.	130	.
SD97250	130	.	129	.
SD97525	112	.	129	.
SD97839-Hls	96	.	88	.
MN97239	112	.	101	.
Test avg. :	113	104	122	.
LSD (5%) $:	11	19	11	.
CV (%) #:	7	6	6	.

+ Entry is in top-yield group.
$ LSD (5%) - how much two yield values must differ to be significantly different.
# A measure of experimental error; a value of 15% or less is best.

SE FARM REPORT

SDSU

WEED CONTROL DEMONSTRATIONS and EVALUATION TESTS for 2001

L. J. Wrage, D. L. Deneke, D. A. Vos, and S. A. Wagner

Plant Science 0122

INTRODUCTION:

Evaluation and extension demonstration plots provide weed control data for the area served by the Southeast Experiment Farm. Plots provide side-by-side comparisons reflecting local conditions. The station is the major site for corn and soybean weed control studies.

2001 TESTS:

Soil moisture was adequate in early spring, however mid-May through June was dry. Waterhemp emergence was delayed and reduced. Some grass emergence was noted after early post treatments. Postemerge timing was difficult due to the dry period with reduced emergence. Yield comparisons indicate unusually high levels of competition, even from moderate or light densities. Early control was important for optimum results.

Tests at the station focus on common waterhemp, velvetleaf, cocklebur, and foxtail. Tests include side-by-side demonstration comparisons and evaluation plots used for more comprehensive data collection.

The cooperation and direct assistance from station personnel is acknowledged. Field equipment and management of the plot areas are important contributions to the project. Extension educators provide assistance with tours and utilize the data in direct producer programs.

NOTE: ***Data reported in this publication are results from field tests that include product uses, experimental products or experimental rates, combinations or other unlabeled uses for herbicide products. Tradenames of products used are listed; there frequently are other brand products available in the market. Users are responsible for applying herbicide according to label directions. Refer to the appropriate weed control fact sheet available from county extension offices for herbicide recommendations.***

Studies listed below are summarized in the following tables. Information for each study is included as part of the summary.

1. Corn Herbicide Demonstration
2. Herbicide Tolerant Corn
3. Cocklebur Control in Corn
4. Velvetleaf Control in Corn
5. Preemergence Weed Control Programs in Corn
6. Weed Control Programs in Corn
7. Velvetleaf Control with Aim
8. Weed Control with Touchdown in Corn
9. Weed Control in Corn
10. No-Till Corn Demonstration
11. Preemergence Weed Control in No-Till Corn
12. 1X & 2X Corn Rate - Pre
13. 1X & 2X Corn Rate – Post
14. 2000 1X & 2X Soybean Rate – Pre
15. Soybean Herbicide Demonstration
16. Herbicide Tolerant Soybeans
17. Cocklebur Soybean Demonstration
18. Common Waterhemp Control in Soybeans
19. Preemergence Weed Control in Soybeans
20. Weed Control with Valor
21. Preemergence Programs Ahead of Glyphosate
22. Soybean Weed Control Programs
23. Weed Removal Timing in Soybeans
24. 1X & 2X Soybean Rate – Pre
25. 1X & 2X Soybean Rate – Post
26. 2000 1X & 2X Corn Rate – Post
27. 2000 1X & 2X Corn Rate – Pre

Additional evaluation plots include initial tests with experimental herbicides, additives, tests with specific products or rate comparisons. Data collected for these tests are reported in the W.E.E.D. Project Data Reports.

Corn

1. Preemergence Weed Control
2. 1X and 3X Preemergence Herbicide Corn Tolerance
3. Weed Control with Steadfast and Various Additives
4. Tank-Mixes, Rates, and Adjuvants with AE F1300360
5. Reduced Cost Weed Control
6. Reduced Rate Programs
7. Respray Options

8. Standard vs Tolerant Weed Control
9. Waterhemp Control
10. Simulated Drift
11. Weed Control with Starane
12. Weed Removal Timing
13. No-Till Weed Control with Callisto Tank-Mixes

Soybeans

1. Velvetleaf Soybean Demonstration
2. No-Till Soybean Demonstration
3. Control of Volunteer RR Corn
4. Weed Control with Phoenix

Table 1. Corn Herbicide Demonstration

Demonstration	Precipitation:		
Planting Date: 5/15/01	SPPI/PRE:	1st week	1.02 inches
Variety: Dekalb 493RR		2nd week	0.00 inches
PPI/PRE: 5/15/01	LPRE:	1st week	0.68 inches
LPRE: 5/29/01		2nd week	0.40 inches
EPOST: 6/7/01	EPOST:	1st week	0.56 inches
POST: 6/15/01		2nd week	0.00 inches
POST1: 6/22/01	POST:	1st week	0.00 inches
Soil: Silty clay loam; 3.2% OM; 5.9 pH		2nd week	0.28 inches
	POST1:	1st week	0.28 inches
Grft=Green foxtail		2nd week	0.40 inches
Cowh=Common waterhemp			

COMMENTS: Heavy foxtail pressure. Delayed and extended early season grass emergence.

Treatment	Rate/A	% Grft 7/13/01	% Cowh 7/13/01
Check	—-	0	0
PREEMERGENCE			
Dual II Magnum	2 pt	99	99
Lasso	3 qt	98	98
Prowl	3.6 pt	96	93
Harness	2.3 pt	98	98
Harness	1.5 pt	95	96
Outlook	21 oz	91	97
Degree	4.25 pt	90	98
Define	18 oz	85	87
Axiom	22 oz	83	94
Balance Pro	2.25 oz	85	99
Balance Pro+Surpass	2.25 oz+1.25 pt	89	99
Balance Pro+Surpass	1.5 oz+1.25 pt	85	98
Balance Pro+atrazine	2.25 oz+1 qt	83	99
Epic	13 oz	90	99
Epic+atarzine	11 oz+1 qt	92	99
USA2001	13 oz	81	94
TopNotch+Callisto	5 pt+6 oz	89	99
Dual II Magnum+Callisto	1.67 pt+6 oz	87	99
Python+Surpass	1.25 oz+2.5 pt	97	98
Axiom+atrazine	21 oz+1 qt	89	99
Fultime	3 qt	94	99
Bicep Lite II Magnum	2 qt	95	98
Guardsman	2.3 qt	96	99
Harness Xtra	2.1 qt	92	96
Surpass+atrazine+2,4-D ester	1.67 pt+1 qt+1 qt	90	93

2001 Corn Herbicide Demonstration
Southeast Research Farm
Page 2

Treatment	Rate/A	% Grft 7/13/01	% Cowh 7/13/01
LATE PREEMERGENCE			
Harness	2.3 pt	94	98
Harness+atrazine	2.3 pt+1 qt	93	97
SHALLOW PREPLANT INCORPORATED			
DoublePlay	5 pt	80	93
Surpass	2.5 pt	86	95
Outlook	21 oz	92	82
Define	18 oz	89	62
PREEMERGENCE & POSTEMERGENCE			
Lasso&Clarity	1.5 pt&1 pt	60	94
Lasso&Distinct+NIS+28% N	1.5 pt&6 oz+.25%+1 qt	79	86
Lasso&2,4-D amine	1.5 pt&1 pt	50	99
Lasso&Shotgun	1.5 pt&3 pt	55	99
Lasso&PCC-196+LI-700	1.5 pt&3 pt+.25%	50	99
PREEMERGENCE			
Lasso	1.5 pt	55	60
PREEMERGENCE & POSTEMERGENCE1			
Lasso&Permit+NIS	1.5 pt&.67 oz+.5%	64	98
Lasso&Starane+Hornet WDG+ LI-700+28% N	1.5 pt&.67 pt+3 oz+ .25%+2 qt	48	99
Lasso&Buctril	1.5 pt&1.5 pt	58	99
Lasso&Buctril/atrazine	1.5 pt&2 pt	45	99
Lasso&Sencor+atrazine	1.5 pt&2 oz+1.5 pt	50	99
PREEMERGENCE & POSTEMERGENCE			
Outlook&Clarity+28% N	21 oz&8 oz+2 qt	98	99
Outlook&Marksman+28% N	21 oz&3.5 pt+2 qt	99	99
PREEMERGENCE & POSTEMERGENCE1			
Balance Pro&Buctril/atrazine	2.62 oz&1 qt	90	99
Surpass&Aim+atrazine+ NIS+28%N	2.5 pt&.33 oz+1 qt+ .25%+2 qt	98	99
Surpass&Aim+Callisto+ NIS+28% N	2.5 pt&.33 oz+3 oz+ .25%+2 qt	97	98
Surpass&Hornet WDG+Clarity+ NIS+28% N	2.5 pt&3 oz+4 oz+ .25%+2 qt	97	99
Surpass&Hornet WDG+NIS+28% N	2.5 pt&3 oz+.25%+2 qt	98	97
Surpass&Hornet WDG+atrazine+ NIS+28% N	2.5 pt&3 oz+1.5 pt+ .25%+2 qt	96	98
Surpass&Aim+Hornet WDG+ NIS+28% N	2.5 pt&.33 oz+3 oz+ .25%+2 qt	98	99

2001 Corn Herbicide Demonstration
Southeast Farm
Page 3

Treatment	Rate/A	% Grft 7/13/01	% Cowh 7/13/01
PREEMERGENCE & POSTEMERGENCE1			
Dual II Magnum&Callisto+	1.67 pt&3 oz+		
COC+28% N	1%+2 qt	99	97
Dual II Magnum&Callisto+atrazine+	1.67 pt&3 oz+1 pt+		
COC+28% N	1%+2 qt	99	97
Dual II Magnum&Northstar+	1.67 pt&5 oz+		
NIS+28% N	.25%+2 qt	95	98
Dual II Magnum&Northstar+	1.67 pt&5 oz+		
atrazine+NIS+28% N	1 qt+.25%+2 qt	93	97
Dual II Magnum&Tough 5L+	1.67 pt&1 pt+		
COC+28% N	1%+2 qt	92	95
Dual II Magnum&Tough 5L+	1.67 pt&1 pt+		
atrazine+COC+28% N	1 pt+1%+2 qt	93	99
EARLY POSTEMERGENCE			
Dual II Magnum+Callisto+	1.67 pt+3 oz+		
COC+28% N	1%+2 qt	68	99
POSTEMERGENCE			
Aim+Accent+atrazine+	.33 oz+.67 oz+1 pt+		
COC+28% N	1%+2 qt	88	91
PREEMERGENCE & POSTEMERENCE			
Outlook&Distinct+NIS+28% N	21 oz& 6 oz+.25%+1 qt	94	92
Outlook&Distinct+atrazine+	21 oz&6 oz+1.5 pt+		
NIS+28% N	.25%+1 qt	98	99
PREEMERGENCE			
Outlook	21 oz	96	96
PREEMERGENCE & POSTEMERGENCE1			
Surpass&Accent+atrazine+	2.5 pt&.33 oz+1.5 pt+		
COC+28% N	1%+2 qt	98	99
Surpass&Accent+atrazine+	1.25 pt&.67 oz+1.5 pt+		
COC+28% N	1%+2 qt	98	99
Surpass&Accent+COC+28% N	1.25 pt&.33 oz+1%+2 qt	91	98
Surpass&Accent+atrazine+	1.25 pt&.33 oz+1.5 pt+		
COC+28% N	1%+2 qt	90	99
Harness&Steadfast+COC+28% N	1.25 pt&.75 oz+1%+2 qt	98	98
Harness&Accent Gold+Accent+	1.25 pt&2.9 oz+.25 oz+		
COC+28% N	1%+2 qt	97	95
Harness&Basis Gold+Clarity+	1.25 pt&14 oz+4 oz+		
COC+28% N	1%+2 qt	96	99

Treatment	Rate/A	% Grft 7/13/01	% Cowh 7/13/01
EARLY POSTEMERGENCE			
Harness+Basis Gold+Clarity+ COC+28% N	1.25 pt+14 oz+4 oz+ 1%+2 qt	89	95
Prowl+Accent+Clarity+ NIS+28% N	3 pt+.33 oz+.5 pt+ .25%+2 qt	85	99
Basis+COC+28% N	.33 oz+1%+2 qt	68	78
Basis Gold+COC+28% N	14 oz+1%+2 qt	78	93
POSTEMERGENCE			
Accent+COC+28% N	.67 oz+1%+2 qt	91	25
Steadfast+COC+28% N	.75 oz+1%+2 qt	90	48
Define+atrazine+COC+28% N	12 oz+1.5 pt+1%+2 qt	50	99
Accent Gold+COC+28% N	2.9 oz+1%+2 qt	89	78
Accent Gold+atrazine+ COC+28% N	2.9 oz+1.5 pt+ .25%+2 qt	78	85
Celebrity Plus+NIS+28% N	4.7 oz+.25%+2 qt	86	82
Celebrity Plus+atrazine+ NIS+28% N	4.7 oz+1.5 pt+ .25%+2 qt	84	88
Accent+atrazine+Clarity+ COC+28% N	.67 oz+1.5 pt+4 oz+ 1%+2 qt	86	90
Accent+atrazine+Aim+ COC+28% N	.67 oz+1.5 pt+.33 oz+ 1%+2 qt	78	98
Accent+Aim+COC+28% N	.67 oz+.33 oz+1%+2 qt	85	65
Accent+Northstar+NIS+28% N	.67 oz+5 oz+.25%+2 qt	89	68
Accent+Northstar+atrazine+ NIS+28% N	.67 oz+5 oz+1.5 pt+ .25%+2 qt	92	74

Table 2. Herbicide Tolerant Corn

Demonstration
Planting Date: 5/15/01
Variety: See comments
PRE: 5/15/01
EPOST: 6/15/01
POST: 6/22/01
Soil: Silty clay loam; 3.2% OM; 5.9 pH

Precipitation:		
PRE:	1st week	1.02 inches
	2nd week	0.00 inches
EPOST:	1st week	0.00 inches
	2nd week	0.28 inches
POST:	1st week	0.28 inches
	2nd week	0.40 inches

Grft=Green foxtail
Cowh=Common waterhemp

COMMENTS: Varieties planted: DK 493RR, Pioneer 37H26-LL, Pioneer 37M38 Clearfield. Moderate foxtail and waterhemp pressure. Several split programs produced excellent results.

Treatment	Rate/A	% Grft 7/13/01	% Cowh 7/13/01
Check - ROUNDUP READY	----	0	0
EARLY POSTEMERGENCE			
Roundup Ultramax+AMS	26 oz+2 lb	89	66
Harness+Roundup Ultramax+AMS	2.3 pt+26 oz+2 lb	99	98
POSTEMERGENCE			
Roundup Ultramax+AMS	26 oz+2 lb	99	98
EARLY POSTEMERGENCE & POSTEMERGENCE			
Roundup Ultramax+AMS&Roundup Ultramax+AMS Roundup Ultramax+AMS	26 oz+2 lb&24 oz+2 lb	99	99
ReadyMaster ATZ+AMS&Roundup Ultramax+AMS	2 qt+2 lb&26 oz+2 lb	98	99
PREEMERGENCE & POSTEMERGENCE			
Harness&Roundup Ultramax+AMS	1 pt&26 oz+2 lb	98	99
Harness&Roundup Ultramax+AMS	2.3 pt&26 oz+2 lb	99	99
Atrazine&Roundup Ultramax+AMS	1.5 qt&26 oz+2 lb	97	99
Dual II Magnum&Touchdown 3L+AMS	1.67 pt&1 qt+2 lb	99	98
Surpass&Glyphomax Plus+AMS	2.75 pt&1 pt+2 lb	99	99
Surpass&Roundup Ultramax (3X)+Atrazine+AMS	2.5 pt&78 oz+1.5 pt+2 lb	99	99
Check - LIBERTY LINK	----	0	0
PREEMERGENCE & POSTEMERGENCE			
Balance Pro&Liberty+AMS	1.87 oz&28 oz+3 lb	90	98
Surpass&Liberty (3X)+atrazine+AMS	2.5 pt&96 oz+1.5 pt+3 lb	99	99
EARLY POSTEMERGENCE			
Liberty&atrazine+AMS	32 oz&1 pt+3 lb	85	74
Liberty+AMS	32 oz+3 lb	89	20

Treatment	Rate/A	% Grft 7/13/01	% Cowh 7/13/01
POSTEMERGENCE			
Liberty+atrazine+AMS	32 oz+1 pt+3 lb	79	95
EARLY POSTEMERGENCE & POSTEMERGENCE			
Liberty+atrazine+AMS&Liberty+AMS	24 oz+1 pt+3 lb&24 oz+3 lb	94	99
Check - IMI	----	0	0
EARLY POSTEMERGENCE			
Lightning+NIS+28% N	1.28 oz+.25%+2 qt	78	58
Lightning+Clarity+NIS+28% N	1.28 oz+.5 pt+.25%+1 qt	80	78
Lightning+atrazine+NIS+28% N	1.28 oz+1.5 pt+.25%+1 qt	65	99
Lightning+Distinct+NIS+28% N	1.28 oz+4 oz+.25%+1 qt	82	88
PREEMERGENCE & POSTEMERGENCE			
Outlook&Lightning+Marksman+ NIS+28% N	11 oz&1.28 oz+2 pt+ .25%+1 qt	92	95
PREEMERGENCE & EARLY POSTEMERGENCE			
Surpass&Lightning (3X)+atrazine+ NIS+28% N	2.5 pt&3.84 oz+1.5 pt+ .25%+1 qt	99	98

Table 3. Cocklebur Control in Corn

RCB; 2 reps
Planting Date: 5/14/01
Variety: Pioneer 37M38 Clearfield
PRE: 5/14/01
POST: 6/15/01
Soil: Loam; 2.4% OM, 7.0 pH

Precipitation:

PRE:	1st week	1.02 inches
	2nd week	0.00 inches
POST:	1st week	0.00 inches
	2nd week	0.28 inches

Cocb=Common cocklebur

COMMENTS: Very heavy cocklebur density. Excellent yield response for weed control. Some yield variability in test site.

Treatment	Rate/A	% Cocb 9/23/01	Corn Yield bu/A
Check	----	0	74
PREEMERGENCE			
Python+Dual II Magnum	1.25 oz+1.67 pt	48	143
Harness+atrazine	2.5 pt+1 qt	25	126
Axiom+atrazine	23 oz+1 qt	62	124
PREEMERGENCE & POSTEMERGENCE			
Surpass&Lightning+NIS+28% N	2.5 pt&1.28 oz+.25%+2 qt	71	129
Surpass&Buctril	2.5 pt&1 pt	90	143
Surpass&Buctril/atrazine	2.5 pt&2.25 pt	93	144
Surpass&Clarity	2.5 pt&.5 pt	94	133
Surpass&Marksman+28% N	2.5 pt&2.75 pt+2 qt	98	142
Surpass&Shotgun	2.5 pt&3 pt	95	152
Surpass&Permit+NIS	2.5 pt&1 oz+.5%	87	151
Surpass&Hornet WDG+NIS+28% N	2.5 pt&3 oz+.25%+2 qt	89	135
Surpass&2,4-D ester	2.5 pt&8 oz	92	147
Surpass&Northstar+NIS+28% N	2.5 pt&5 oz+.25%+2 qt	93	149
Surpass&Distinct+NIS+28% N	2.5 pt&6 oz+.25%+2 qt	94	148
Surpass&Starane+LI-700	2.5 pt&.67 pt+.25%	86	131
Surpass&Callisto+COC+28% N	2.5 pt&3 oz+1%+2 qt	89	132
LSD (.05)		11	22

Table 4. Velvetleaf Control in Corn

Demonstration
Planting Date: 5/14/01
Variety: See comments
PRE: 5/14/01
EPOST: 6/15/01
POST: 6/29/01
Soil: Silty clay loam; 3.0% OM; 6.9 pH

Precipitation:

PRE:	1st week	1.02 inches
	2nd week	0.00 inches
EPOST:	1st week	0.00 inches
	2nd week	0.28 inches
POST:	1st week	0.40 inches
	2nd week	0.04 inches

Cowh=Common waterhemp
Vele=Velvetleaf

COMMENTS: Demonstration. Moderate weed pressure. Several treatments provided very good control of waterhemp and velvetleaf.

Treatment	Rate/A	% Cowh 8/22/01	% Vele 8/22/01
Check	----	0	0
PREEMERGENCE			
Dual II Magnum+Python	1.67 pt+1.25 oz	65	55
Dual II Magnum+atrazine	1.67 pt+2 qt	98	78
Dual II Magnum+atrazine	1.67 pt+1 qt	94	65
Dual II Magnum+Callisto	1.67 pt+6 oz	96	98
Balance Pro	1.5 oz	70	98
Balance Pro	2.25 oz	75	98
Balance Pro+atrazine	1.87 oz+1 qt	94	98
Axiom+atrazine	21 oz+1 qt	98	90
PREEMERGENCE & POSTEMERGENCE			
Balance Pro&Buctril/atrazine	2.25 oz&1.5 pt	96	96
Lasso&atrazine+COC	1.5 qt&1 qt+1 qt	96	45
Lasso&Tough 5L+atrazine+COC	1.5 qt&.75 pt+1 qt+1 qt	95	60
Lasso&atrazine+COC	1.5 qt&2 qt+1 qt	96	65
Lasso&Distinct+NIS+28% N	1.5 qt&6 oz+.25%+2 qt	96	92
Lasso&Distinct+atrazine+ NIS+28% N	1.5 qt&4 oz+1.5 pt+ .25%+2 qt	98	86
Lasso&Marksman+28% N	1.5 qt&3 pt+2 qt	98	90
Lasso&Buctril/atrazine	5 qt&1.5 pt	98	70
Lasso&Shotgun	1.5 qt&3 pt	98	94
Lasso&PCC-196	1.5 qt&3 pt	98	94
Lasso&2,4-D amine	1.5 qt&1 pt	98	88
Lasso&Sencor+2,4-D amine	1.5 qt&2 oz+.5 pt	98	90
Lasso&Permit+NIS	1.5 qt& .67 oz+.25%	84	86
Lasso&Resource+COC	1.5 qt&4 oz+1 qt	94	92
Lasso&Hornet WDG+NIS+28% N	1.5 qt&3 oz+.25%+2 qt	92	94

Treatment	Rate/A	% Cowh 8/22/01	% Vele 8/22/01
PREEMERGENCE & POSTEMERGENCE			
Lasso&Hornet WDG+Aim+ NIS+28% N	1.5 qt&3 oz+.33 oz+ .25%+2 qt	98	98
Lasso&Resource+atrazine+ COC+28% N	1.5 qt&4 oz+1 pt+ 1 qt+2 qt	98	95
Lasso&Aim+NIS	1.5 qt&.33 oz+.25%	94	92
Lasso&Aim+atrazine+NIS	1.5 qt&.33 oz+1.5 pt+.25%	98	98
Lasso&Northstar+NIS+28% N	1.5 qt&5 oz+.25%+2 qt	88	92
Lasso&Callisto+COC+28% N	1.5 qt&3 oz+1%+2 qt	96	94
Lasso&Accent Gold+COC+28% N	1.5 qt&2.9 oz+1%+2 qt	98	98
Lasso&Celebrity Plus+NIS+28% N	1.5 qt&4.7 oz+.25%+2 qt	98	98
Lasso&Starane+LI-700	1.5 qt&.67 pt+.25%	98	98
Lasso&Buctril/atrazine	1.5 qt&2 pt	98	88
PREEMERGENCE			
Lasso	1.5 qt	92	68
PREEMERGENCE & EARLY POSTEMERGENCE & POSTEMERGENCE			
Lasso&Liberty+AMS& Liberty+AMS	1.5 qt&20 oz+3 lb& 24 oz+3 lb	98	94
PREEMERGENCE & EARLY POSTEMERGENCE			
Lasso&Liberty+atrazine+AMS	1.5 qt&32 oz+1.5 pt+3 lb	98	55
PREEMERGENCE & POSTEMERGENCE			
Lasso&Lightning+NIS+28% N	1.5 qt&1.28 oz+1%+1 qt	98	60
Lasso&Lightning+atrazine+ NIS+28% N	1.5 qt&1.28 oz+1.5 pt+ 1%+1 qt	98	78

Table 5. Preemergence Weed Control Programs in Corn

RCB; 3 reps
Planting Date: 5/15/01
Variety: DeKalb 493RR
PRE: 5/15/01
Soil: Clay; 3.1% OM; 7.1 pH

Precipitation:

PRE:	1st week	1.02 inches
	2nd week	0.00 inches

VCRR=Visual Crop Response Rating
(O=no injury; 100=complete kill)
Grft=Green foxtail
Cowh=Common waterhemp

COMMENTS: Slow weed emergence; early ratings at 5 weeks. Very good waterhemp control. Foxtail control was satisfactory for several treatments that provided at least 85% control; yield was reduced with less foxtail control.

Treatment	Rate/A	Corn % VCRR 6/22/01	% Grft 8/22/01	% Cowh 8/22/01	Corn Yield bu/A
Check	----	0	0	0	92
PREEMERGENCE					
Balance Pro	2.25 oz	0	82	98	119
Callisto	4.5 oz	0	41	98	94
Balance Pro	3 oz	0	84	92	122
Callisto	5.6 oz	0	35	92	91
Balance Pro+atrazine	3 oz+1 qt	0	95	97	113
Callisto+atrazine	5.6 oz+1 qt	0	65	96	125
Balance Pro+Define	3 oz+12 oz	0	93	98	128
Callisto+TopNotch	5.6 oz+2 qt	0	91	98	129
Balance Pro+Define+ atrazine	3 oz+12 oz+ 1 qt	0	95	99	121
Callisto+TopNotch+ atrazine	5.6 oz+2 qt+ 1 qt	0	90	97	135
Callisto+Dual II Magnum	5.6 oz+1.67 pt	0	90	97	130
Define	12 oz	0	81	77	129
TopNotch	2 qt	0	89	98	136
Dual II Magnum	1.67 pt	0	87	98	132
LSD (.05)		0	10	8	20

Table 6. Weed Control Programs in Corn

RCB; 3 reps
Planting Date: 5/14/01
Variety: Dekalb 493RR
PRE: 5/14/01
POST: 6/22/01
Soil: Silty clay loam; 2.9% OM; 6.2 pH

Precipitation:

PRE:	1st week	1.02 inches
	2nd week	0.00 inches
POST:	1st week	0.28 inches
	2nd week	0.40 inches

VCRR=Visual Crop Response Rating
(O=no injury; 100=complete kill)
Grft=Green foxtail
Cowh=Common waterhemp

COMMENTS: Uniform plot area. Excellent common waterhemp control. Satisfactory crop tolerance. Atrazine tended to improve grass control in preemergence treatments.

Treatment	Rate/A	Corn % VCRR 7/22/01	% Grft 8/2/01	% Cowh 8/2/01
Check	----	0	0	0
PREEMERGENCE				
Dual II Magnum+Callisto	1.67 pt+6 oz	0	82	98
Dual II Magnum+Callisto+atrazine	1.67 pt+6 oz+1 qt	0	85	99
Bicep II Magnum	2.1 qt	0	88	99
PREEMERGENCE & POSTEMERGENCE				
Dual II Magnum&Callisto+ COC+28% N	1.67 pt&3 oz+ 1%+2 qt	2	75	99
Bicep II Magnum&Callisto+ COC+28% N	2.1 qt&3 oz+ 1%+2 qt	0	96	99
Dual II Magnum&Callisto+ atrazine+COC+28% N	1.67 pt&3 oz+ .5 pt+1%+2 qt	0	92	99
Frontier&Marksman	1.87 pt&3.5 pt	3	78	99
Dual II Magnum&Spirit+ COC+28% N	1.67 pt&1 oz+ 1%+2 qt	2	89	98
LSD (.05)		3	5	1

Table 7. Velvetleaf Control with Aim

RCB; 4 reps
Planting Date: 5/14/01
Variety: DeKalb 493RR
PRE: 5/14/01
EPOST: 6/15/01
POST: 6/25/01
Soil: Silty clay loam; 3.4% OM; 6.3 pH

Precipitation:

PRE:	1st week	1.02 inches
	2nd week	0.00 inches
EPOST:	1st week	0.00 inches
	2nd week	0.28 inches
POST:	1st week	0.72 inches
	2nd week	0.04 inches

Vele=Velvetleaf
Grft=Green foxtail
Cocb=Common cocklebur

COMMENTS: Moderate velvetleaf pressure. Data suggests 10% late emergence for velvetleaf. Atrazine + Aim and Aim + Callisto combinations provided excellent late-season ratings. Stand variability due to cutworm; yields not harvested.

Treatment	Rate/A	% Vele 7/18/01	% Grft 8/14/01	% Cocb 8/14/01	% Vele 8/14/01
Check	----	0	0	0	0
PREEMERGENCE & POSTEMERGENCE					
Surpass&Aim+ atrazine+COC	2.5 pt&.33 oz+ 1 qt+1%	97	99	79	96
Surpass&Aim+atrazine+ Clarity+NIS	2.5 pt&.33 oz+1 pt+ 4 oz+.25%	89	87	94	80
Surpass&Aim+ Clarity+NIS	2.5 pt&.33 oz+ 4 oz+.25%	83	82	98	77
Surpass&Aim+ Hornet+NIS	2.5 pt&.33 oz+ 3 oz+.25%	91	95	96	86
Surpass&Aim+ Northstar+NIS	2.5 pt&.33 oz+ 5 oz+.25%	95	96	99	89
Surpass&Aim+Starane+ atrazine+NIS	2.5 pt&.33 oz+.67 pt+ 1 pt+.25%	89	97	98	84
Surpass&Aim+ Spirit+NIS	2.5 pt&.33 oz+ 1 oz+.25%	89	98	97	83
Surpass&Aim+ Beacon+NIS	2.5 pt&.33 oz+ .38 oz+.25%	90	98	78	77
Surpass&Aim+ Exceed+NIS	2.5 pt&.33 oz+ 1 oz+.25%	90	97	97	84
Surpass&Aim+Callisto+ COC+28% N	2.5 pt&.33 oz+3 oz+ 1%+2 qt	99	96	98	99
EARLY POSTEMERGENCE					
Aim+Basis Gold+ COC+28% N	.33 oz+14 oz+ 1%+2 qt	87	73	81	86
Aim+Accent Gold+ COC+28% N	.33 oz+2.9 oz+ 1%+2 qt	85	86	74	80
Aim+Steadfast+ COC+28% N	.33 oz+.75 oz+ 1%+2 qt	84	95	44	77
Aim+Roundup Ultra+AMS	.33 oz+1.5 pt+3 lb	90	89	89	85
LSD (.05)		9	6	12	9

Table 8. Weed Control with Touchdown in Corn

RCB; 3 reps
Planting Date: 5/14/01
Variety: DeKalb 493RR
PRE: 5/14/01
EPOST: 6/22/01
POST: 6/28/01
Soil: Silty clay loam; 2.9% OM; 6.5 pH

Precipitation:

PRE:	1st week	1.02 inches
	2nd week	0.00 inches
EPOST:	1st week	0.28 inches
	2nd week	0.40 inches
POST:	1st week	0.40 inches
	2nd week	0.04 inches

Grft=Green foxtail
Cowh=Common waterhemp

COMMENTS: Light grass pressure. All treatments provided excellent weed control. Yield similar for all treatments.

Treatment	Rate/A	% Grft 8/2/01	% Cowh 8/2/01	Corn Yield bu/A
Check	----	0	0	124
PREEMERGENCE & POSTEMERGENCE				
Dual II Magnum&	1.33 pt&			
Touchdown 3L+AMS	1.5 pt+2 lb	99	99	147
Dual II Magnum&	1.33 pt&			
Touchdown 3L+AMS	2 pt+2 lb	99	99	153
EARLY POSTEMERGENCE				
Dual II Magnum+	1.33 pt+			
Touchdown 3L+AMS	1.5 pt+2 lb	99	92	141
EARLY POSTEMERGENCE & POSTEMERGENCE				
Touchdown 3L+AMS&	1.5 pt+2 lb&			
Touchdown 3L+AMS	1.5 pt+2 lb	97	96	142
LSD (.05)		2	5	20

Table 9. Weed Control in Corn

RCB; 4 reps	Precipitation:			
Planting Date: 5/14/01		PRE:	1st week	1.02 inches
Variety: DeKalb 493RR			2nd week	0.00 inches
PRE: 5/14/01		EPOST:	1st week	0.28 inches
EPOST: 6/22/01			2nd week	0.40 inches
POST: 6/29/01		POST:	1st week	0.40 inches
POST1: 7/7/01			2nd week	0.04 inches
Soil: Silty clay loam; 3.1% OM; 7.1 pH		POST1:	1st week	0.00 inches
			2nd week	0.35 inches

Grft=Green foxtail
Cowh=Common waterhemp

COMMENTS: Moderate foxtail; delayed and extended waterhemp emergence. Dry late June and July. Atrazine improved consistency especially for waterhemp. Yield for treatments similar.

Treatment	Rate/A	% Grft 7/10/01	% Grft 8/16/01	% Cowh 8/16/01	Corn Yield bu/A
__Check	----	0	0	0	57
EARLY POSTEMERGENCE					
Roundup Ultramax+AMS	26 oz+2 lb	91	87	84	96
Harness Xtra+	1.2 pt+				
Roundup Ultramax+AMS	26 oz+2 lb	93	93	87	100
Harness Xtra+	1.85 pt+				
Roundup Ultramax+AMS	26 oz+2 lb	94	89	97	96
ReadyMaster ATZ+AMS	2 qt+2 lb	95	94	99	96
EARLY POSTEMERGENCE & POSTEMERGENCE1					
Roundup Ultramax+AMS&	26 oz+2 lb&				
Roundup Ultramax+AMS	20 oz+2 lb	92	88	84	94
PREEMERGENCE & POSTEMERGENCE					
Harness&	1.2 pt&				
Roundup Ultramax+AMS	26 oz+2 lb	96	94	95	87
Harness Xtra&	1.85 pt&				
Roundup Ultramax+AMS	26 oz+2 lb	93	90	98	92
Dual II Magnum&Marksman	1.5 pt&3.5 pt	84	80	98	88
Bicep II Magnum&Northstar+	2 qt&5 oz+				
NIS+28% N	.25%+2 qt	91	89	99	82
PREEMERGENCE					
Bicep II Magnum	2 qt	86	83	97	94

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Treatment	Rate/A	% Grft 7/10/01	% Grft 8/16/01	% Cowh 8/16/01	Corn Yield bu/A
PREEMERGENCE & EARLY POSTEMERGENCE					
Bicep II Magnum&	1 qt&				
Touchdown 3L+AMS	1 qt+2 lb	95	90	97	88
Fultime&	1.5 qt&				
Glyphomax Plus+AMS	1 qt+2 lb	94	91	99	89
LeadOff&Basis Gold+	1.3 qt&14 oz+				
COC+28% N	1 qt+4 qt	90	86	98	87
LSD (.05)		7	9	10	14

Table 10. No-Till Corn Demonstration

Demonstration	Precipitation:		
Planting Date: 5/15/01	EPP:	1st week	2.21 inches
Variety: See comments		2nd week	0.88 inches
EPP: 4/20/01	PRE:	1st week	1.02 inches
PRE: 5/15/01		2nd week	0.00 inches
EPOST: 6/15/01	EPOST:	1st week	0.00 inches
Soil: Silty clay loam; 3.2% OM; 6.6 pH		2nd week	0.28 inches

Grft=Green foxtail

COMMENTS: One quart Roundup applied at burndown. Varieties planted: DK 580RR and Pioneer 37H26 LL. Green foxtail evaluation only. Heavy rain following EPP may have reduced residual for late weed flushes. Favorable conditions for preemergence treatments. Control for EPP timing tended to be 10% less than for the same treatment preemergence. Reduced rates were less effective than full rate. Atrazine alone was less effective than combinations.

Treatment	Rate/A	% Grft 10/16/01
Check	----	0
EARLY PREPLANT		
TopNotch	6 pt	83
Dual II Magnum	2 pt	85
Dual II Magnum+atrazine	2 pt+1 qt	85
Degree	5 pt	78
Harness	2.75 pt	75
PREEMERGENCE		
Dual II Magnum	2 pt	83
Dual II Magnum+atrazine	2 pt+1 qt	95
Degree	5.5 pt	88
Harness	3 pt	80
Harness	1.5 pt	70
Harness	2.5 pt	80
TopNotch	6 pt	90
Harness+atrazine	2.5 pt+1 qt	94
Balance Pro+Surpass+atrazine	2.25 oz+1.25 pt+1 qt	95
Balance Pro+atrazine	2.25 oz+1 qt	95
Bicep Lite II Magnum	1.5 qt	90
Outlook	21 oz	88
Surpass	1 pt	65
Surpass	1.25 pt	58
Surpass	2.5 pt	78
Balance Pro	1.87 oz	89

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Treatment	Rate/A	% Grft 10/16/01
PREEMERGENCE		
Surpass+Python	2.5 pt+1.25 oz	98
Axiom+atrazine	21 oz+1 qt	95
TopNotch+Callisto	5 pt+6 oz	90
Atrazine	1 qt	50
Atrazine	2 qt	65
EARLY POSTEMERGENCE		
Liberty+AMS	32 oz+3 lb	80
Liberty+atrazine+AMS	20 oz+1.5 pt+3 lb	80
Roundup Ultra+AMS	1 pt+2 lb	70
Outlook+Distinct+atrazine+ NIS+28% N	21 oz+4 oz+1.5 pt+ .25%+1.25%	75
Accent Gold+atrazine+ COC+28% N	2.9 oz+1.5 pt+ 1%+4 qt	84
Celebrity Plus+atrazine+ NIS+28% N	4.7 oz+1.5 pt+ .25%+2.5%	95

Table 11. Preemergence Weed Control in No-Till Corn

RCB; 4 reps
Planting Date: 5/15/01
Variety: DeKalb 580RR
PRE: 5/15/01
Soil: Silty clay; 3.7% OM; 6.6 pH

Precipitation:

PRE:	1st week	1.02 inches
	2nd week	0.00 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)
Grft=Green foxtail

COMMENTS: Light foxtail pressure. Very good grass control. Limited mid-season weed flush.

Treatment	Rate/A	Corn % VCRR 6/21/01	% Grft 6/21/01	Corn Yield bu/A
Check	----	0	0	107
PREEMERGENCE				
Axiom+atrazine	22 oz+1.5 pt	0	97	121
Harness Xtra	2.1 qt	0	90	119
Epic	13 oz	10	93	113
Epic+atrazine	13 oz+1.5 pt	4	97	124
USA 2001	13 oz	0	93	125
USA 2001+atrazine	13 oz+1.5 pt	0	98	132
LSD (.05)		5	5	15

Table 12. 1X & 2X Corn Rate – Pre

RCB; 3 reps
Planting Date: 5/15/01
Variety: DK 580RR
PRE: 5/15/01
Soil: Silty clay; 3.0% OM; 6.0 pH

Precipitation:

PRE:	1st week	1.02 inches
	2nd week	0.00 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)
Grft=Green foxtail

COMMENTS: Acceptable crop tolerance for all treatments at normal maximum use rates.

Treatment	Rate/A	% Grft 7/15/01	Corn % VCRR Stunt 7/15/01	Corn Yield bu/A
Check	----	0	0	118
PREEMERGENCE				
Atrazine	2 qt	95	7	117
Atrazine (2X)	4 qt	98	0	139
Dual II Magnum	2 pt	97	0	140
Dual II Magnum (2X)	4 pt	99	0	139
Balance Pro	2.62 oz	96	3	134
Balance Pro (2X)	5.24 oz	99	43	100
Axiom	23 oz	98	0	135
Axiom (2X)	46 oz	99	0	133
LSD (.05)		2	5	20

Table 13. 1X & 2X Corn Rate – Post

RCB; 3 reps	Precipitation:			
Planting Date: 5/15/01		PRE:	1st week	1.02 inches
Variety: DK580RR			2nd week	0.00 inches
PRE: 5/15/01		EPOST:	1st week	0.56 inches
EPOST: 6/7/01			2nd week	0.00 inches
POST: 6/15/01		POST:	1st week	0.00 inches
Soil: Silty clay; 3.0% OM; 6.0 pH			2nd week	0.28 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)

COMMENTS: Purpose to provide data and visual crop response to application problems involving higher than labeled rates. Roundup applied to eliminate weed competition factor. Treatments compare normal maximum rate with 2X rate. No yield reduction was noted for the 2X rate for any treatment.

Treatment	Rate/A	Corn % VCRR Root	Corn Yield bu/A
Check	----	0.0	140
POSTEMERGENCE			
Accent+COC+28% N	.67 oz+1%+2 qt	0.0	135
Accent (2X)+COC+28% N	1.33 oz+1%+2 qt	0.0	144
2,4-D amine	1 pt	0.3	129
2,4-D amine (2X)	2 pt	1.8	135
Buctril	1.5 pt	0.0	135
Buctril	3 pt	0.0	135
Hornet WDG+NIS+28% N	5 oz+.25%+2.5%	0.0	135
Hornet WDG (2X)+NIS+28% N	10 oz+.25%+2.5%	0.0	136
Callisto+COC+28% N	3 oz+1%+2 qt	0.0	140
Callisto (2X)+COC+28% N	6 oz+1%+2 qt	0.0	135
Aim+NIS	.33 oz+.25%	0.0	141
Aim (2X)+NIS	.67 oz+.25%	0.0	140
EARLY POSTEMERGENCE			
Distinct+NIS+28% N	6 oz+.25%+1.25%	0.0	134
Distinct (2X)+NIS+28% N	12 oz+.25%+1.25%	0.0	132
Steadfast+COC+28% N	.75 oz+1%+2 qt	0.0	133
Steadfast (2X)+COC+28% N	1.5 oz+1%+2 qt	0.0	141
Basis+NIS+28%N	.33 oz+.25%+2 qt	0.0	135
Basis (2X)+NIS+28% N	.67 oz (2X)+.25%+2 qt	0.0	138
LSD (.05)		.4	14

Table 14. 1X & 2X Soybean Rate – Pre

RCB; 4 reps
Variety: Soybean - Stine 616754-13
Corn - DK 580RR
Planting Date: 5/23/00; 5/15/01
PRE: 5/23/00
Soil: Silty clay; 3.7% OM; 6.4 pH

Precipitation:
PRE: 1st week 0.24 inches
2nd week 1.22 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)

COMMENTS: Purpose to evaluate carryover response to X and 2X herbicide treatments applied to soybeans in 2000. RR corn planted in 2001 using Roundup to remove weed competition factor. Double rates did not reduce soybean yield under 2001 conditions.

Treatment	Rate/A	Soybean % VCRR Stunting 6/15/00	2000 Soybean Yield bu/A	2001 Corn Yield bu/A
Check	----	0	37	91
PREEMERGENCE				
Prowl	3 pt	0	37	95
Prowl (2X)	6 pt	0	34	94
Command 3ME	2.6 pt	0	38	99
Command 3ME (2X)	5.2 pt	0	36	98
Python	1 oz	0	36	89
Python (2X)	2 oz	5	34	96
Authority	5.33 oz	0	39	86
Authority (2X)	10.67 oz	0	32	100
Frontier	2 pt	0	34	96
Frontier (2X)	4 pt	0	37	103
Sencor	.67 lb	0	35	95
Sencor (2X)	1.33 lb	5	32	91
FirstRate	.75 oz	0	34	95
FirstRate	1.5 oz	0	33	89
LSD (.05)		2	6	15

Table 15. Soybean Herbicide Demonstration

Demonstration	Precipitation:			
Planting Date: 5/29/01	PPI/PRE:	1st week	0.68 inches
Variety: NK S14-M7		2nd week	0.40 inches
PPI/PRE: 5/29/01	EPOST:	1st week	0.40 inches
EPOST: 6/26/01		2nd week	0.04 inches
POST: 6/28/01	POST:	1st week	0.40 inches
POST1: 7/7/01		2nd week	0.04 inches
Soil: Clay; 3.1% OM; 7.1 pH	POST1:	1st week	0.00 inches
		2nd week	0.35 inches

Grft=Green foxtail
Cowh=Common waterhemp
Colq=Common lambsquarter

COMMENTS: Side-by-side comparisons. Favorable moisture early season. Dry midseason, delayed and reduced late weed flush. Excellent foxtail control, several treatments exceeded 95% waterhemp control. Light lambsquarter density.

Treatment	Rate/A	% Grft 7/13/01	% Cowh 7/13/01	% Colq 7/13/01
Check	----	0	0	0
PREPLANT INCORPORATED				
Treflan	1.5 pt	88	91	99
Sonalan	2.67 pt	91	94	99
Prowl	3 pt	83	88	98
Treflan+Sencor	1.5 pt+.5 lb	84	92	99
Treflan+Authority	1.5 pt+4 oz	82	89	99
PREPLANT INCORPORATED & PREEMERGENCE				
Trelfan&Authority	1.5 pt&4 oz	80	91	98
PREPLANT INCORPORATED & POSTEMERGENCE1				
Prowl&Pursuit DG+ MSO+28% N	2.5 pt&1.44 oz+ 1 qt+1 qt	97	98	99
Prowl&Raptor+MSO+28% N	2.5 pt&4 oz+1 qt+1 qt	96	97	99
Prowl&Raptor+FirstRate+ MSO+28% N	2.5 pt&4 oz+.3 oz+ 1 qt+1 qt	95	98	99
Prowl&Raptor+FirstRate+ MSO+28% N	2.5 pt&2 oz+.3 oz+ 1 qt+1 qt	94	96	98
Prowl&Pursuit DG+FirstRate+ MSO+28% N	2.5 pt&.72 oz+.3 oz+ 1 qt+1 qt	89	93	98
Prowl&Pursuit DG+Flexstar+ MSO+28% N	2.5 pt&.72 oz+10 oz+ 1 qt+1 qt	84	99	99
Prowl&Raptor+Flexstar+ MSO+28% N	2.5 pt&4 oz+10 oz+ 1 qt+1 qt	96	99	99
Treflan&FirstRate+MSO+28% N	1.5 pt&.3 oz+1 qt+1 qt	93	88	98
Treflan&FirstRate+Flexstar+ MSO+28% N	1.5 pt&.3 oz+10 oz+ 1qt+1 qt	94	99	99

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Treatment	Rate/A	% Grft 7/13/01	% Cowh 7/13/01	% Colq 7/13/01
PREEMERGENCE				
Gauntlet	4A/pkt	55	98	98
Command Xtra	10A/pkt	62	86	97
FirstRate	.75 oz	40	94	95
Axiom	13 oz	78	82	84
Domain	14 oz	72	97	99
Boundary	2.5 pt	93	99	99
Boundary+Authority	1.5 pt+4 oz	90	98	99
PREEMERGENCE & POSTEMERGENCE1				
Valor&Poast Plus+COC	3 oz&1.5 pt+1 qt	96	99	99
Valor+Python&Poast Plus+COC	3 oz+1 oz&1.5 pt+1 qt	98	99	99
Authority+Lorox&Assure II+COC	4 oz+24 oz&7 oz+1 qt	89	78	98
Gauntlet&	4A/pkt&			
Poast Plus+COC	1.5 pt+1 qt	97	89	99
Command Xtra&	10A/pkt&			
Poast Plus+COC	1.5 pt+1 qt	98	74	98
EARLY POSTEMERGENCE & POSTEMERGENCE				
Poast Plus+COC&	1.5 pt+1 qt&			
Basagran+COC	1 qt+1 qt	99	10	86
Poast Plus+COC&	1.5 pt+1 qt&			
Ultra Blazer+NIS	1.5 pt+.25%	99	25	89
Poast Plus+COC&	1.5 pt+1 qt&			
Cobra+COC	.8 pt+1 pt	96	55	74
Poast Plus+COC&	1.5 pt+1 qt&			
Phoenix+COC	.8 pt+1 pt	97	80	58
Poast Plus+COC&	1.5 pt+1 qt&			
Flexstar+MSO+28% N	12 oz+1 qt+1 qt	96	86	50
Poast Plus+COC&	1.5 pt+1 qt&			
Flexstar+MSO+28% N	16 oz+1 qt+1 qt	95	88	68
Poast Plus+COC&	1.5 pt+1 qt&			
FirstRate+MSO+28% N	.3 oz+1 qt+1 qt	98	20	82
Poast Plus+COC&	1.5 pt+1 qt&			
Harmony GT+NIS	.083 oz+.25%	98	30	95
Poast Plus+COC&	1.5 pt+1 qt&			
Synchrony+NIS+28% N	.25 oz+.25%+1 qt	99	30	82
Poast Plus+COC&	1.5 pt+1 qt&			
Basagran+Pursuit DG+COC	1 pt+.72 oz+1 qt	98	25	95
Poast Plus+COC&	1.5 pt+1 qt&			
Pursuit DG+Cobra+	1.44 oz+6 oz+			
MSO+28% N	1 pt+1 qt	94	68	72
Poast Plus+COC&	1.5 pt+1 qt&			
Flexstar+Pursuit DG+	12 oz+.72 oz+			
MSO+28% N	1 qt+2 qt	95	86	80

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Treatment	Rate/A	% Grft 7/13/01	% Cowh 7/13/01	% Colq 7/13/01
Check	----	0	0	0
EARLY POSTEMERGENCE				
Select+Flexstar+MSO+28% N	7 oz+12 oz+1 qt+1 qt	99	96	55
Fusion+Flexstar+MSO+28% N	10 oz+12 oz+1 qt+1 qt	98	97	35
FirstRate+Flexstar+Select+ MSO+28% N	.3 oz+10 oz+6 oz+ 1 qt+1 qt	99	98	48
Flexstar+Fusion+Harmony GT+ MSO+28% N	10 oz+10 oz+.04 oz+ 1 qt+1 qt	40	99	99
Raptor+MSO+28% N	5 oz+1 qt+1 qt	86	58	98
Pursuit DG+MSO+28% N	1.44 oz+1 qt+1 qt	90	20	98
Raptor+Flexstar+MSO+28% N	4 oz+8 oz+1 qt+1 qt	78	82	86
Raptor+Flexstar+MSO+28% N	4 oz+12 oz+1 qt+1 qt	75	87	89
Raptor+FirstRate+MSO+28% N	4 oz+.3 oz+1 qt+1 qt	80	40	97
Pursuit DG+FirstRate+ MSO+28% N	1.44 oz+.3 oz+ 1 qt+1 qt	84	28	96
Poast Plus+Pursuit DG+ FirstRate+Flexstar+Resource+ MSO+NIS+28% N	.56 pt+.36 oz+ .075 oz+4 oz+1 oz+ .25%+.063%+1 pt	40	98	88

Table 16. Herbicide Tolerant Soybeans

Demonstration	Precipitation:		
Planting Date: 5/29/01	PPI/PRE:	1st week	0.68 inches
Variety: NK S14-M7		2nd week	0.40 inches
PPI/PRE: 5/29/01	EPOST:	1st week	0.40 inches
EPOST: 6/29/01		2nd week	0.04 inches
POST: 7/7/01	POST:	1st week	0.00 inches
Soil: Silty clay loam; 3.1% OM; 7.1 pH		2nd week	0.35 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)

Grft=Green foxtail
Cowh=Common waterhemp

COMMENTS: Nearly complete weed control for most treatments. VCRR represents plant growth; primarily represents competition effect comparing early post and post timing; not treatment response.

Treatment	Rate/A	Soybean % VCRR 8/22/01	% Grft 8/22/01	% Cowh 8/22/01
Check	----	0	0	0
EARLY POSTEMERGENCE				
Roundup Ultramax+AMS	.8 pt+2 lb	0	98	96
Roundup Ultramax+AMS	.8 qt+2 lb	0	99	97
Extreme+NIS+AMS	1.5 qt+.25%+2 lb	0	99	99
Extreme+Flexstar+NIS+AMS	1.5 qt+12 oz+.25%+2 lb	0	99	97
EARLY POSTEMERGENCE & POSTEMERGENCE				
Roundup Ultramax+AMS&	.8 pt+2 lb&			
Roundup Ultramax+AMS	.8 pt+2 lb	0	99	99
PREPLANT INCORPORATED & POSTEMERGENCE				
Treflan&Roundup Ultramax+AMS	1.5 pt+.8 pt+2 lb	0	99	98
Prowl&Extreme+NIS+AMS	2.5 pt+1.5 qt+.25%+2 lb	0	99	99
PREEMERGENCE & POSTEMERGENCE				
Authority&	4 oz&			
Roundup Ultramax+AMS	1.2 pt+2 lb	0	99	97
Command 3ME&	2 pt&			
Roundup Ultramax+AMS	1.2 pt+2 lb	0	99	99
Python&	1 oz&			
Glyphomax Plus+AMS	1.5 pt+2 lb	0	99	99
Axiom&Roundup Ultramax+AMS	13 oz&1.5 pt+2 lb	0	99	99
Domain&Roundup Ultramax+AMS	12 oz&1.2 pt+2 lb	0	99	99
Domain+Authority&	9 oz+4 oz&			
Roundup Ultramax+AMS	1.2 pt+2 lb	0	99	99

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Treatment	Rate/A	Soybean % VCRR 8/22/01	% Grft 8/22/01	% Cowh 8/22/01
PREEMERGENCE & POSTEMERGENCE				
Boundary&Touchdown 3L+AMS	1.25 pt&1.5 pt+2 lb	0	99	99
FirstRate+Authority&	.75 oz+6.7 oz&			
Roundup Ultramax+AMS	1.2 pt+2 lb	0	99	99
Valor&Roundup Ultramax+AMS	2 oz&1.2 pt+2 lb	0	99	99
Frontier&Roundup Ultramax+AMS	20 oz&1.2 pt+2 lb	0	99	99
EARLY POSTEMERGENCE				
Frontier+Roundup Ultramax+AMS	20 oz+1.2 pt+2 lb	0	99	99
POSTEMERGENCE				
Roundup Ultramax+AMS	1.6 qt+2 lb	10	99	99
Roundup Ultradry+AMS	2.4 lb+2 lb	10	99	99
Touchdown 3L+AMS	2 qt+2 lb	10	99	98
Glyphomax Plus+AMS	2 qt+2 lb	10	99	98
Glyfos X-tra+AMS	2 qt+2 lb	10	99	99
Roundup Ultramax+Resource+AMS	1.2 pt+4 oz+2 lb	15	99	96
Roundup Ultramax+Cobra+AMS	.8 pt+10 oz+2 lb	15	98	92
Roundup Ultramax+Synchrony+AMS	.8 pt+.25 oz+2 lb	15	98	96
Roundup Ultramax+Flexstar+AMS	.8 pt+8 oz+2 lb	15	96	87
Roundup Ultramax+Supporrt+AMS	.8 pt+.5 oz+2 lb	15	97	85
Glyphomax Plus+FirstRate+AMS	1.5 pt+.3 oz+2 lb	15	98	93
EARLY POSTEMERGENCE & POSTEMERGENCE				
Roundup Ultramax+AMS&	.8 qt+2 lb&			
Roundup Ultramax+AMS	.8 qt+2 lb	0	99	99
Roundup Ultradry+AMS&	1.2 lb+2 lb&			
Roundup Ultradry+AMS	1.2 lb+2 lb	0	99	99
Touchdown 3L+AMS&	1 qt+2 lb&			
Touchdown 3L+AMS	1 qt+2 lb	0	99	99
Glyphomax Plus+AMS&	1 qt+2 lb&			
Glyphomax Plus+AMS	1 qt+2 lb	0	99	99
Glyfos X-tra+AMS&	1 qt+2 lb&			
Glyfos X-tra	1 qt+2 lb	0	99	99
Roundup Ultramax+AMS&	.8 qt+2 lb&			
Roundup Ultramax+AMS	3.2 qt+2 lb	0	99	99
Roundup Ultradry+AMS&	1.2 lb+2 lb&			
Roundup Ultradry+AMS	4.8 lb+2 lb	0	99	99
Touchdown 3L+AMS&	1 qt+2 lb&			
Touchdown 3L+AMS	4 qt+2 lb	0	99	99
Glyphomax Plus+AMS&	1 qt+2 lb&			
Glyphomax Plus+AMS	4 qt+2 lb	0	99	99
Glyfos X-tra+AMS&	1 qt+2 lb&			
Glyfos X-tra+AMS	4 qt+2 lb	0	99	99

Table 17. Cocklebur Soybean Demonstration

RCB; 2 reps
Planting Date: 5/29/01
Variety: Asgrow
PPI/PRE: 5/29/01
POST: 6/28/01
POST1: 7/9/01
Soil: Loam; 2.9% OM; 6.5 pH

Precipitation:

PPI/PRE:	1st week	0.68 inches
	2nd week	0.40 inches
POST:	1st week	0.46 inches
	2nd week	0.04 inches
POST1:	1st week	0.31 inches
	2nd week	1.82 inches

Cocb=Common cocklebur

COMMENTS: Very heavy cocklebur density. Yields suggest early cocklebur competition affected yield more than late emerging waterhemp that emerged in plots with early cocklebur control.

Treatment	Rate/A	% Cocb 8/22/01	% Cowh 8/22/01	Soybean Yield bu/A
Check	----	0	0	3
PREPLANT INCORPORATED				
Python	1 oz	20	28	19
FirstRate	.6 oz	15	23	20
PREPLANT INCORPORATED & PREEMERGENCE				
Sencor&Sencor	.5 lb&.33 lb	8	75	21
PREEMERGENCE				
Gauntlet	4A/pkt	43	75	28
POSTEMERGENCE				
Basagran+COC	1 qt+1 qt	99	10	26
Cobra+COC+28% N	.8 pt+.5 qt+4 qt	89	80	32
Ultra Blazer+NIS	1.5 pt+.5%	13	73	15
Pursuit DG+MSO+28% N	1.44 oz+1 qt+ 1qt	98	23	27
Classic+NIS	.33 oz+.125%	74	35	18
Harmony GT+NIS	.083 oz+.125%	8	15	11
Synchrony+NIS	.25 oz+.125%	90	63	26
Basagran+Pursuit DG+COC+28% N	1 pt+.72 oz+1 qt+2 qt	99	10	26
Raptor+MSO+28% N	5 oz+1.5 pt+1 qt	99	8	19
FirstRate+NIS+28% N	.3 oz+.125%+2 qt	98	18	21
Flexstar+MSO+28% N	16 oz+1%+2 qt	90	88	44
POSTEMERGENCE & POSTEMERGENCE1				
Basagran+COC&Basagran+COC	1 pt+1 qt&1 pt+1 qt	98	18	32
glyphosate+AMS&glyphosate+AMS	1 pt+2 lb&1 pt+2 lb	99	99	46
POSTEMERGENCE				
glyphosate+Supporrt+AMS	1 pt+.5 oz+2 lb	99	97	49
glyphosate+AMS	1 pt+2 lb	98	94	36
LSD (.05)		7	14	9

Table 18. Common Waterhemp Control in Soybeans

RCB; 4 reps
Planting Date: 5/29/01
Variety: Pioneer Brand 1901RR
PRE: 5/29/01
EPOST: 6/28/01
POST: 7/7/01
Soil: Silty clay loam; 2.9% OM; 6.2 pH

Precipitation:

PRE:	1st week	0.68 inches
	2nd week	0.40 inches
EPOST:	1st week	0.40 inches
	2nd week	0.04 inches
POST:	1st week	0.00 inches
	2nd week	0.35 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)

Grft=Green foxtail
Cowh=Common waterhemp
BDLF=Lambsquarter, pigweed, smartweed

COMMENTS: Heavy weed pressure. Foxtail competition effect was extreme; significant impact on yield. Crop response (reduced height) to grass competition reflected in VCRR ratings.

Treatment	Rate/A	Soybean % VCRR Ht. Red. 8/16/01	% Grft 8/16/01	% Cowh 8/16/01	% BDLF 8/16/01	Soybean Yield bu/A
Check	----	33	0	0	0	4
PREPLANT INCORPORATED						
Treflan	2 pt	4	90	70	97	27
Prowl	3.6 pt	4	90	76	92	30
Sonalan	2.67 pt	0	97	86	95	32
Treflan+Sencor	1.5 pt+.5 lb	1	89	91	85	32
Treflan+Python	1.5 pt+1 oz	0	95	90	99	33
Treflan+Authority	1.5 pt+4 oz	4	91	93	98	35
PREPLANT INCORPORATED & POSTEMERGENCE						
Python&Poast Plus+COC	1 oz&1.5 pt+1 qt	4	98	46	99	30
Prowl&Pursuit DG+ Ultra Blazer+MSO+ 28% N	3.6 pt&1.44 oz+ 10 oz+1%+ 2 lb	4	97	98	95	32
Treflan&Ultra Blazer+NIS	1.5 pt&12 oz+.5%	10	72	95	94	34
Treflan&Cobra+COC	1.5 pt&.8 pt+1 pt	6	81	97	86	30
Treflan&FirstRate+ NIS+28% N	1.5 pt&.3 oz+ .125%+2 qt	8	82	78	86	33
Treflan&Flexstar+ COC+28% N	1.5 pt&12 oz+ 1%+2 qt	0	88	97	98	36
Treflan&Synchrony+ NIS+28% N	1.5 pt&.25 oz+ .25%+1 qt	4	87	86	84	36
Treflan& Roundup Ultra+AMS	1.5 pt& 1 pt+2 lb	0	99	99	99	42

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Treatment	Rate/A	Soybean % VCRR Ht. Red. 8/16/01	% Grft 8/16/01	% Cowh 8/16/01	% BDLF 8/16/01	Soybean Yield bu/A
PREEMERGENCE & POSTEMERGENCE						
Command Xtra&	10A/pkt&					
Poast Plus+COC	1.5 pt+1 qt	0	99	91	92	33
Gauntlet&	4A/pkt&					
Poast Plus+COC	1.5 pt+1 qt	4	94	98	99	37
Domain&Poast Plus+COC	14 oz&1.5 pt+1 qt	1	98	90	85	34
Valor+Python&	3 oz+1 oz&					
Poast Plus+COC	1.5 pt+1 qt	0	99	98	99	42
Authority&Poast Plus+COC	4 oz&1.5 pt+1 qt	11	92	88	99	29
Authority&	5.33 oz&					
Poast Plus+COC	1.5 pt+1 qt	11	95	88	96	36
Boundary&	1.5 pt&					
Roundup Ultra+AMS	1 pt+2 lb	1	99	99	99	38
Authority&Outlook+	3 oz&12 oz+					
Pursuit DG+	1.44 oz+					
NIS+AMS	.25%+2 lb	3	78	90	99	35
EARLY POSTEMERGENCE						
Extreme+Flexstar+	1.5 qt+10 oz+					
NIS+AMS	.125%+2 lb	11	99	94	97	32
Pursuit DG+MSO+28% N	1.44 oz+1 qt+1 qt	24	29	38	85	15
Roundup Ultra+AMS	1 qt+2 lb	9	96	93	96	35
EARLY POSTEMERGENCE & POSTEMERGENCE						
Roundup Ultra+AMS&	1 pt+2 lb&					
Roundup Ultra+AMS	1 pt+2 lb	3	99	99	99	37
LSD (.05)		9	15	9	13	5

Table 19. Preemergence Weed Control in Soybeans

RCB; 3 reps
Planting Date: 5/29/01
Variety: NK S14 M-7
PRE: 5/29/01
POST: 7/9/01
Soil: Silty clay loam; 2.9% OM; 6.2 pH

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)

Precipitation:

PRE:	1st week	0.68 inches
	2nd week	0.40 inches
POST:	1st week	0.31 inches
	2nd week	1.82 inches

Grft=Green foxtail
Cowh=Common waterhemp

COMMENTS: Very limited precipitation during June; delayed waterhemp emergence; prolonged, slow foxtail emergence. Pronounced yield response to weed control. Data provides an example of critical weed competition; control is excess of 90% required.

Treatment	Rate/A	Soybean % VCRR 6/17/01	% Grft 7/9/01	% Grft 8/2/01	% Cowh 8/2/01	Soybean Yield bu/A
Check	----	0	0	0	0	2
PREEMERGENCE & POSTEMERGENCE						
Gauntlet&	4A/pkt&					
Select+COC	6 oz+1 qt	0	58	80	97	40
Gauntlet&	4A/pkt&					
glyphosate+AMS	1.5 pt+2 lb	0	68	99	99	43
Gauntlet&	5A/pkt&					
glyphosate+AMS	2 pt+2 lb	0	45	99	99	43
Pursuit Plus&Select+COC	2.5 pt&6 oz+1 qt	2	87	96	45	25
Domain&Select+COC	14 oz&6 oz+1 qt	0	48	66	77	37
Boundary&Select+COC	2.5 pt&6 oz+1 qt	0	95	99	91	38
Python+Dual II Magnum&	1 oz+1.67 pt&					
Select+COC	6 oz+1 qt	0	84	95	84	39
Command Xtra&	10A/pkt&					
Select+COC	6 oz+1 qt	2	88	96	94	46
Prowl+FirstRate&	3.6 pt+.75 oz&					
Select+COC	6 oz+1 qt	3	90	95	72	31
LSD (.05)		3	7	4	7	7

Table 20. Weed Control with Valor

RCB; 4 reps
Planting Date: 5/29/01
Variety: NK S14-M7
PRE: 5/29/01
POST: 7/9/01
Soil: Silty clay loam; 2.7% OM; 7.1 pH

Precipitation:

PRE:	1st week	0.68 inches
	2nd week	0.40 inches
POST:	1st week	0.31 inches
	2nd week	1.82 inches

Cocb=Common cocklebur
Cowh=Common waterhemp

COMMENTS: Heavy cocklebur, moderate velvetleaf and waterhemp, light and variable foxtail. Delayed soybean canopy. FirstRate or Python combinations with Valor were the most effective preemergence treatments. Glyphosate treatments were most effective.

Treatment	Rate/A	% Cocb 8/22/01	% Cowh 8/22/01
Check	----	0	0
PREEMERGENCE			
Valor	2 oz	34	74
Sencor	4 oz	56	78
Valor+Sencor	2 oz+4 oz	34	81
FirstRate	.6 oz	91	31
Valor+FirstRate	2 oz+.6 oz	92	84
Python	.7 oz	60	39
Valor+Python	2 oz+.7 oz	68	90
POSTEMERGENCE			
Roundup Ultramax+AMS	.8 qt+2.5 lb	99	96
PREEMERGENCE & POSTEMERGENCE			
Valor&Roundup Ultramax+AMS	2 oz&.8 qt+2.5 lb	99	98
Valor&Roundup Ultramax+AMS	1.5 oz&.8 qt+2.5 lb	99	98
LSD (.05)		12	11

Table 21. Preemergence Programs Ahead of Glyphosate

RCB; 3 reps	Precipitation:			
Planting Date: 5/29/01		PRE:	1st week	0.68 inches
Variety: Asgrow			2nd week	0.40 inches
PRE: 5/29/01		EPOST:	1st week	0.40 inches
EPOST: 6/28/01			2nd week	0.04 inches
POST: 7/9/01		POST:	1st week	0.31 inches
Soil: Silty clay loam; 2.9% OM; 6.2 pH			2nd week	1.02 inches

Grft=Green foxtail
Cowh=Common waterhemp

COMMENTS: Moderate to severe stunt was apparent on post alone treatments from competition. Effective preemergence or early post treatments produced optimum results in this test. Foxtail and waterhemp affected yield.

Treatment	Rate/A	% Grft 6/28/01	% Cowh 6/28/01	% Grft 8/2/01	% Cowh 8/2/01	Soybean Yield bu/A
Check	----	0	0	0	0	3
PREEMERGENCE & POSTEMERGENCE						
Axiom&glyphosate+AMS	13 oz&24 oz+2 lb	86	75	99	98	38
Domain&glyphosate+AMS	14 oz&24 oz+2 lb	85	85	98	98	46
Boundary&glyphosate+AMS	2.5 pt&24 oz+2 lb	97	96	99	99	45
Sencor&glyphosate+AMS	8 oz&24 oz+2 lb	71	91	98	98	39
PREEMERGENCE						
Axiom+FirstRate	13 oz+.75 oz	66	73	62	71	31
POSTEMERGENCE						
glyphosate+AMS	32 oz+2 lb	—	—	97	97	24
EARLY POSTEMERGENCE & POSTEMERGENCE						
glyphosate+AMS&	24 oz+2 lb&					
glyphosate+AMS	24 oz+2 lb	—	—	98	98	36
PREEMERGENCE & POSTEMERGENCE						
Sencor+Prowl&	6 oz+3 pt&					
glyphosate+AMS	24 oz+2 lb	63	95	99	98	41
LSD (.05)		11	5	2	4	7

Table 22. Soybean Weed Control Programs

RCB; 4 reps
Planting Date: 5/29/01
Variety: Asgrow
PRE: 5/29/01
EPOST: 6/28/01
POST: 7/9/01
Soil: Silty clay loam; 2.9% OM; 6.2 pH

Precipitation:

PRE:	1st week	0.68 inches
	2nd week	0.40 inches
EPOST:	1st week	0.40 inches
	2nd week	0.04 inches
POST:	1st week	0.31 inches
	2nd week	1.82 inches

Grft=Green foxtail
Cowh=Common waterhemp
Colq=Common lambsquarter

COMMENTS: Moderate weed pressure; very severe competition effect. A preemergence or effective early postemergence program provided optimum results.

Treatment	Rate/A	% Grft 8/2/01	% Cowh 8/2/01	% Colq 8/2/01	Soybean Yield bu/A
__Check	----	0	0	0	2
PREEMERGENCE & POSTEMERGENCE					
Boundary&Flexstar+Fusion+ COC+28% N	1.25 pt&1 pt+10 oz+ 1%+2.5%	91	99	79	44
Boundary&Touchdown 3L+AMS	1.25 pt&1 qt+2 lb	99	99	99	45
Boundary&Touchdown 3L+AMS	2.5 pt&1.5 pt+2 lb	99	99	99	46
EARLY POSTEMERGENCE					
Flexstar+Fusion+Harmony GT+ COC+28% N	1 pt+10 oz+.04 oz+ 1%+2.5%	25	78	47	14
POSTEMERGENCE					
Touchdown 3L+AMS	1 qt+2 lb	99	99	99	28
EARLY POSTEMERGENCE & POSTEMERGENCE					
Touchdown 3L+AMS& Touchdown 3L+AMS	1.5 pt+2 lb& 1.5 pt+2 lb	98	98	99	39
LSD (.05)		4	5	6	7

Table 23. Weed Removal Timing in Soybeans

RCB; 4 reps
Planting Date: 5/29/01
Variety: NK S14-M7
3 Weeks: 6/23/01
4 Weeks: 6/28/01
5 Weeks: 7/7/01
Soil: Silty clay; 3.5% OM; 6.6 pH

Precipitation:

3 Weeks:	1st week	0.28 inches
	2nd week	0.44 inches
4 Weeks:	1st week	0.40 inches
	2nd week	0.04 inches
5 Weeks:	1st week	0.00 inches
	2nd week	0.55 inches

Grft=Green foxtail
Cowh=Common waterhemp

COMMENTS: Very severe weed competition. Weather delayed earlier application.

Treatment	Rate/A	% Grft 8/22/01	% Cowh 8/22/01	Soybean Yield bu/A
Check	----	0	0	2
3 Weeks				
glyphosate+AMS	1 qt+2 lb	97	94	20
4 Weeks				
glyphosate+AMS	1 qt+2 lb	98	99	19
5 Weeks				
glyphosate+AMS	1 qt+2 lb	99	99	10

Table 24. 1X & 2X Soybean Rate – Pre

RCB; 4 reps	Precipitation:
Planting Date: 5/29/01	PRE: 1st week 0.68 inches
Variety: Prairie Brand 1901RR	2nd week 0.40 inches
PRE: 5/29/01	
Soil: Clay; 3.1% OM; 7.1 pH	VCRR=Visual Crop Response Rating (0=no injury; 100=complete kill)

COMMENTS: Purpose to provide data and visual crop response to application related problems involving higher than labeled rate. Treatments compare the normal maximum rate with 2X rate. Yield reduction was not significant with double rate. Plots will be rotated to corn in 2002 to evaluate carryover.

Treatment	Rate/A	Soybean % VCRR Stunt 8/22/01	Soybean Yield bu/A
Check	----	1	31
PREEMERGENCE			
Command 3ME	2.6 pt	0	36
Command 3ME (2X)	5.2 pt	3	35
Python	1 oz	6	34
Python	2 oz	5	34
Authority	5.33 oz	1	37
Authority (2X)	10.67 oz	4	36
Frontier	2 pt	3	34
Frontier (2X)	4 pt	0	37
Sencor	.67 lb	5	34
Sencor (2X)	1.33 lb	3	34
FirstRate	.75 oz	8	36
FirstRate	1.5 oz	0	37
LSD (.05)		7	4

Table 25. 1X & 2X Soybean Rate – Post

RCB; 4 reps
Planting Date: 5/29/01
Variety: PB 1901RR
POST: 7/9/01
Soil: Clay; 3.1% OM; 7.1 pH

Precipitation:
POST: 1st week 0.31 inches
2nd week 1.82 inches

VCRR=Visual Crop Response Rating
(0=no injury; 100=complete kill)

COMMENTS: Purpose to provide data and visual crop response associated with application errors involving rates higher than labeled. Treatments compare the normal maximum rate with 2X. None of the 2X rates cause a significant (4 bu) yield reduction. Visual injury (stunting) was not reported at a significant level. Plots will be rotated to corn in 2002 to evaluate carryover.

Treatment	Rate/A	Soybean % VCRR Stunting 8/22/01	Soybean Yield bu/A
Check	----	0	38
POSTEMERGENCE			
Classic+NIS	.33 oz+.25%	0	39
Classic (2X)+NIS	.67 oz+.25%	0	40
Pinnacle+NIS	.25 oz+.25%	0	39
Pinnacle (2X)+NIS	.5 oz+.25%	10	36
Cobra+COC	.8 pt+.5 qt	6	37
Cobra (2X)+COC	1.6 pt+.5 qt	3	36
Ultra Blazer+NIS	1.5 pt+.5%	3	36
Ultra Blazer (2X)+NIS	3 pt+.5%	1	39
Basagran+COC	1 qt+1 qt	0	37
Basagran (2X)+COC	2 qt+1 qt	3	37
Resource+COC	.5 pt+1 qt	1	34
Resource (2X)+COC	1 pt+1 qt	1	38
FirstRate+NIS+28% N	.3 oz+.125%+2 qt	0	38
FirstRate (2X)+NIS+28% N	.6 oz+.125%+2 qt	0	39
Pursuit DG+MSO+28% N	1.44 oz+1.5 pt+1 qt	4	35
Pursuit DG (2X)+MSO+28% N	2.88 oz+1.5 pt+1 qt	3	36
Raptor+MSO+28% N	5 oz+1.5 pt+1 qt	4	35
Raptor (2X)+MSO+28% N	10 oz+1.5 pt+1 qt	4	33
Flexstar+MSO+28% N	16 oz+1%+2 qt	0	40
Flexstar (2X)+MSO+28% N	32 oz+1%+2 qt	0	38
LSD (.05)		6	4

Table 26. 1X & 2X Corn Rate – Post

RCB; 4 reps	Precipitation:
Planting Date: 5/3/00; 6/4/01	EPOST: 1st week 1.22 inches
Variety: Corn - Dekalb 493RR; Soybean PB 1901RR	2nd week 0.08 inches
EPOST: 5/30/00	POST: 1st week 0.12 inches
POST: 6/7/00	2nd week 0.16 inches
Soil: Silty clay; 3.5% OM; 6.6 pH	
	VCRR=Visual Crop Response Rating (0=no injury; 100=complete kill)

COMMENTS: Purpose to evaluate carryover crop response to X and 2X herbicide treatments applied to corn in 2000. RR soybeans planted in 2001 using Roundup to remove weed competition factor. Double rates did not reduce soybean yield under 2001 conditions.

Treatment	Rate/A	Corn % VCRR 8/10/00	Corn Yield bu/A	Soybean Yield bu/A
Check	----	0	99	41
EARLY POSTEMERGENCE				
2,4-D amine	.5 qt	4	86	40
2,4-D amine (2X)	1 qt	1	94	39
Banvel	.5 qt	0	95	39
Banvel (2X)	1 qt	1	91	40
Basis+NIS+28% N	.33 oz+.25%+2 qt	0	98	41
Basis (2X)+NIS+28% N	.67 oz+.25%+2 qt	0	101	40
Distinct+NIS+28% N	6 oz+.25%+1.25%	1	98	41
Distinct (2X)+NIS+28% N	12 oz+.25%+1.25%	0	90	40
POSTEMERGENCE				
Accent+COC+28% N	.67 oz+1%+4 qt	0	95	40
Accent (2X)+COC+28% N	1.33 oz+1%+4 qt	0	98	40
Stinger	.67 pt	0	98	40
Stinger (2X)	1.33 pt	0	100	40
Buctril	1.5 pt	0	97	43
Buctril (2X)	3 pt	0	96	41
Hornet 78.5WDG+NIS+28% N	5 oz+.25%+2.5%	0	95	40
Hornet 78.5WDG (2X)+NIS+28% N	10 oz+.25%+2.5%	0	96	39
LSD (.05)		2	8	3

Table 27. 1X & 2X Corn Rate – Pre

RCB; 4 reps
Variety: Corn - DeKalb 493RR; Soybean PB1901RR
Planting Date: 5/3/00;6/4/01
PRE: 5/3/00
Soil: Silty clay; 3.5% OM; 6.6 pH

Precipitation:

PRE:	1st week	0.28 inches
	2nd week	0.04 inches

COMMENTS: Purpose to evaluate carryover crop response to previous herbicide treatments. Herbicides applied at X and 2X rates in corn in 2001. RR soybeans planted in 2001 using Roundup to remove weeds. Soybean yield was not reduced when comparing X with 2X rate.

Treatment	Rate/A	2000 Corn Yield bu/A	2001 Soybean Yield bu/A
Check	----	93	41
PREEMERGENCE			
Atrazine	2 qt	108	37
Atrazine (2X)	4 qt	94	38
Dual II Magnum	2 pt	93	38
Dual II Magnum (2X)	4 pt	94	40
Outlook	21 oz	96	38
Outlook (2X)	42 oz	100	40
Balance Pro	2.62 oz	93	38
Balance Pro (2X)	5.24 oz	86	36
Axiom	23 oz	96	38
Axiom (2X)	46 oz	97	39
LSD (.05)		14	5

EFFICACY OF HIGH OIL CORN IN REDUCING THE SEVERITY OF A PRRSV CHALLENGE IN GROWING PIGS (TRIAL # 2)

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Animal Science 0123

SUMMARY

The objectives of this experiment were to determine the effects of high oil corn (HOC) on the aerosol transmission of the porcine reproductive and respiratory syndrome virus (PRRSV), and the effects of HOC on PRRSV seroconversion in growing pigs. One hundred PRRSV negative gilts (30.4 kg) were housed in 1 of 2 mirror imaged rooms. Both rooms contained 10 pens with 5 pigs/pen, and each room had its own separate ventilation and manure handling systems. The study was arranged in a 2 x 2 factorial arrangement. The main effects consisted of a dietary energy source, (#2 yellow corn (CON) and HOC), and a virus challenge (with or without). A three-phase feeding program was used, and in each phase the CON and HOC diets contained the same lysine:calorie ratios. Animals were allowed to acclimate to their respective diets for three weeks before the VC was administered. At day 21, fifty pigs (pigs from 5 pens in each room) were inoculated with a tissue culture infectious doses (TCID) 50 of PRRS *virus 23983* (1 X 10^4) intranasally. Blood was collected twice weekly from day 12 to day 50 post-inoculation (PI) and analyzed for serum PRRSV concentrations via ELISA.

PRRSV serum antibody titers peaked at day 50 for the CON diet animals, while day 36 showed the highest antibody tires for the HOC diet animals. The mean serum antibody titers remained lower for animals fed CON diet compared to those fed the HOC diet. HOC fed animals that were challenged with virus had statistically significant (P=.0001) higher serum antibody titers when compared to the animals on the CON diet. Animals fed the CON diet experienced a delay (P=.0001) in measurable PRRSV serum antibody titers compared to those fed the HOC diet. Although the previous trial had shown HOC fed pigs seroconverted at a later date, the current study demonstrated the opposite effect. The HOC delay previously observed may be attributed to effects of HOC on dust reduction affecting the aerosol transmission of PRRSV, and/or the biological effect HOC has on PRRSV challenged pigs. The data from this study indicates a possible biological or environmental vector/affect that may have affected the onset of PRRSV in growing pigs.

INTRODUCTION

Evidence has begun to accumulate in the swine industry to indicate that inclusion of certain fatty acids plays an important role in the regulation of the immune system. Manipulating dietary fatty acid additions, either directly or indirectly, affects the production or regulation of plasma and mononuclear cells. Research has shown that diets with greater concentrations of linoleic acid reflect a greater production of arachidonic acid. This increase in arachidonic acid production results in a product called prostaglandin-E_2 (PGE_2), which then affects and mediates the inflammatory response. Feedstuffs such as HOC contain more energy and linoleic acid than conventional corn and can contribute to the regulation of plasma and mononuclear cell activation.

Compositions of selected nutrients are presented in Table 1. The inclusion of HOC into swine rations not only affects performance but may now lead to altered immunological responses. The increase in linoleic acid in these plants may contribute in altering production practices.

Several disease challenges face the industry today, the main one being Porcine Reproductive and Respiratory Syndrome virus (PRRSV). PRRS has many different clinical forms ranging from subclinical infections to secondary infections that have made it the most economically important disease of swine in the 1990's. Since respiratory and reproductive diseases are primary causes of economic loss in
animal agriculture, this study was initiated to examine the effects that HOC has on immunologically challenged pigs.

MATERIALS AND METHODS

One hundred randomly assigned gilts (30.4 kg) were housed in a 36' X 40' partially slatted confinement building at the Southeast Research Farm in Beresford, SD. This facility consisted of 2 mirror-imaged rooms with separate ventilation and manure handling systems (See Diagram 1). Both rooms contained 10 pens with 5 pigs/pen. Within the building, treatments were arranged in a 2 x 2 factorial (i.e., energy source [CON vs HOC], with or without a PRRSV challenge). A three-phase feeding program was used, and in each phase the CON and HOC diets contained the same lysine:calorie ratios (Table 2). The HOC variety was formulated into diets to contain the same constant lysine to ME ratio as the #2 yellow corn diets. Feed and water were offered ad libitum throughout the trial. A 3-week acclimation period was allowed before administration of the VC to allow for blood and fatty acid profile adaptation. The VC consisted of an intranasal injection of TCID 50 of PRRS *virus 23983* (1 X 10^4). Blood samples were obtained by jugular veinipuncture twice weekly (Monday and Thursday) from day 12 to day 50 PI to evaluate serum chemistry. The PRRSV ELISA (Enzyme-linked Immunosorbent Assay) test kit, (HerdCheck®, IDEXX Laboratories, Westbrook, MA) was used to determine presence or absence of antibody to PRRS. By calculating the S/P (sample to positive) ratio for each sample, animals with S/P ratios less than 0.4 were classified as negative for PRRS antibodies and those greater than 0.4 as positive for PRRS antibodies. Statistical analyses were conducted using GLM procedures of SAS (1988) to evaluate differences in HOC and CON diets. For the VC period, the data were analyzed in comparison to the dietary treatments. Treatments were established to contrast main effects of energy source and immunological challenge. Growth data from this trial was not statistically analyzed because the quarantine procedures did not allow for incremental weights to be obtained.

RESULTS AND DISCUSSIONS

The time frame for PRRSV seroconversion is shown in Graph 1. Animals that were fed the CON diet experienced a delay (P=.0001) in elevated PRRSV serum antibody titers compared to those fed the HOC diet. This delay seems to contradict information from a previous study, and therefore may warrant further investigation. Since linoleic acid may increase the production of arachidonic acid, the mediated inflammatory response may be affected as seen in a previous trial. This delay in inflammatory response would reflect an altered cell-mediated immune mechanism, that responds to cells that produce specific antibody, and/or cells that are able to eliminate the antigen.

The mean serum antibody titers remained lower for animals fed CON diet compared to those fed the HOC diet. HOC fed animals that were challenged with virus had statistically significant (P=.0001) higher serum antibody titers when compared to the animals on the CON diet (Graph 2). The results obtained from this trial directly conflict a previous trial, and therefore need to be evaluated further.

Previous research at this station has shown a 40% reduction in dust particulate when HOC is used in the diet. This reduction in dust was shown to influence the time it took the non-challenged pigs to seroconvert in a previous trial, but was not repeatable during this trial. The previous trial would support the theory of aerosol transmission of the PRRS virus from the challenged pigs. This reduction may influence the transmission of the PRRSV isolate, and also contribute to potential improvement in growth performance.

The data from a previous study indicated that HOC delayed the seroconversion of PRRSV challenged pigs, and may play a role in immunoenhancement in growing pigs. Although the current study demonstrated opposite results, they may be attributed to facility variation and there is biological evidence that would support the objectives of the trial. Further evaluation in facility variables need to be studied in order to accurately recommend the use of HOC in reducing the effect on aerosol transmission of PRRSV in growing pigs.

ACKNOWLEDGMENTS

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Table 1. Nutrient Composition

	Type of Corn		
	CON (#2)	**HOC**	**HOC+**
Oil %	3.54	6.36	8.70
CP %	7.60	8.10	9.00
Starch %	62.00	59.00	55.00
GE kcal.lb	1770.00	1845.00	1910.00
Lysine %	0.26	0.30	0.33
Tryptophan %	0.06	0.07	0.08
Threonine %	0.30	0.33	0.33
Meth + Cyst %	0.37	0.40	0.42
	Percentage of grain at 13% moisture		
Palmitic %	0.41	0.73	1.00
Stearic %	0.06	0.15	0.20
Oleic %	0.92	1.98	3.10
Linoleic %	2.15	3.24	4.20
Linolenic %	0.06	0.08	0.10

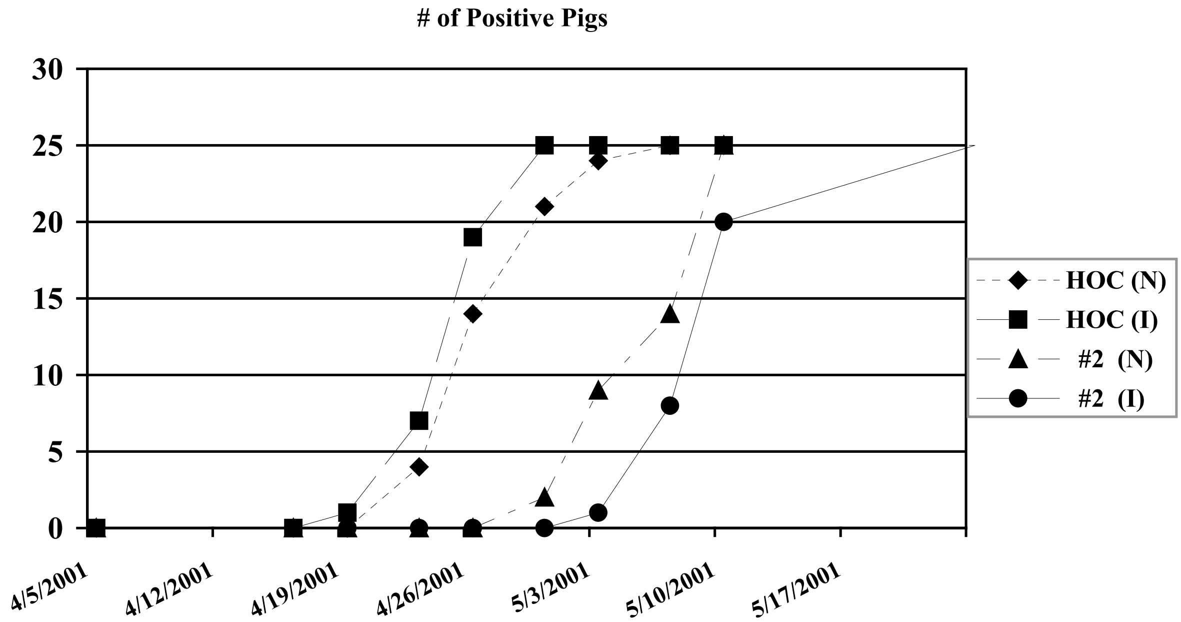
* DuPont Quality Grains, average of 1994 & 1995 values for CON (#2) and Optimum 80 & 140 corn

* Type of HOC represents the increase in G.E. of a pound of moisture-free corn

able 2. Diet Composition (lbs per ton of each feedstuff in the complete diet)

	Grower Diet, lbs		Finisher Diet, lbs		Finisher 2 Diet, lbs	
Ingredient	CON	HOC	CON	HOC	CON	HOC
#2 Yellow Corn	1372.80	-	1485.60	-	1485.60	-
High Oil Corn	-	1355.40	-	1467.90	-	1467.90
Soybean Meal, 44%	570.80	588.20	457.30	475.30	457.30	475.30
Dical Phosphade	24.20	24.20	20.90	20.90	20.90	20.90
Limestone	17.20	17.20	17.20	17.20	17.20	17.20
Salt	5.00	5.00	5.00	5.00	5.00	5.00
Vit/Min Premix	10.00	10.00	10.00	10.00	10.00	10.00
Calculated Levels						
CP, %	18.40	18.70	16.40	16.80	15.10	15.40
Lysine, %	1.00	1.02	.85	.88	.75	.78
Calcium	.70	.70	.65	.65	.60	.60
Phosphorus, %	.60	.61	.55	.55	.50	.50
Lys : Cal **(g lys/Mcal ME)**	3.06	3.04	2.58	2.60	2.27	2.29

Graph 1. PRRSV Seroconversion



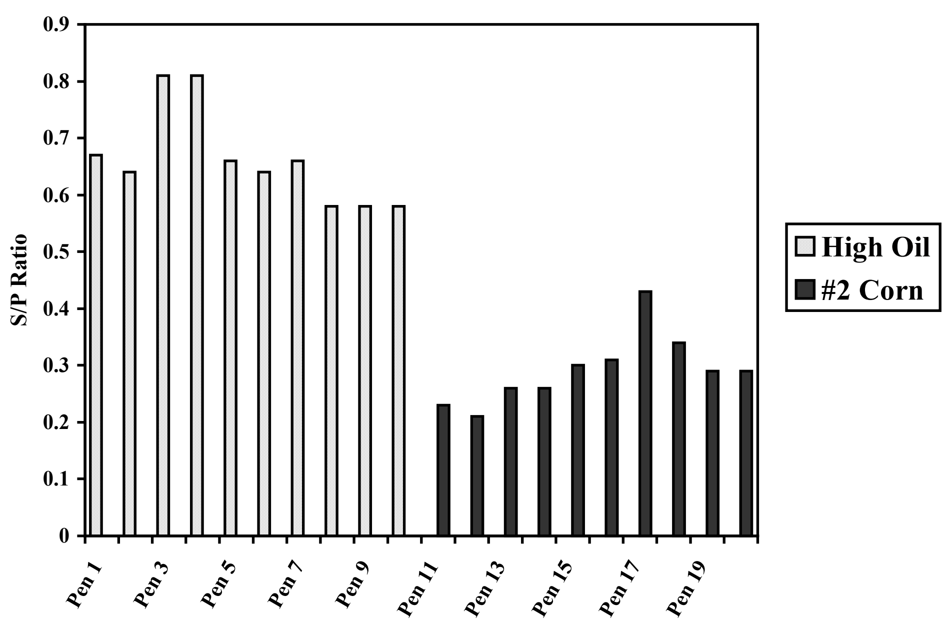


Diagram 1. Barn Layout